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ACORN USER

NOVEMBER 1986

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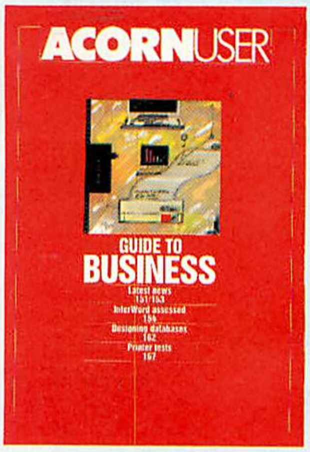
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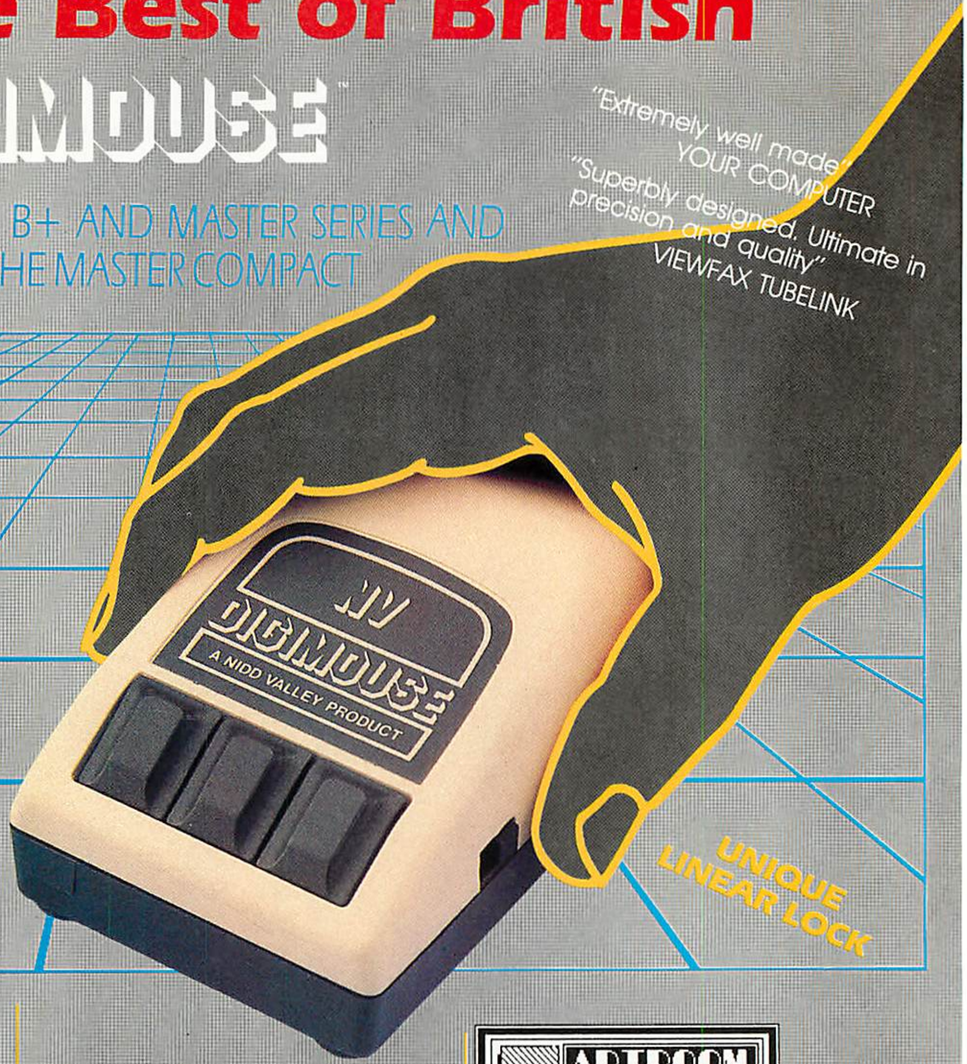
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The mouse features a unique **LINEAR LOCK** switch which means you can draw perfectly straight lines freehand in either X or Y directions using the outer two mouse keys. A very useful extra!

The non-slip ball and optical encoder system is precision engineered for the kind of accuracy and reliability you would expect, and the mouse is supplied with a generous (1.5m) length of cable which trails behind the mouse so it won't get in your way.

As DIGIMOUSE is compatible with many graphic art and word processing packages (including AMX and Wigmore) we offer the mouse on its own for the BBC B, B+ or Master, with machine code routines, – an excellent and economical alternative!

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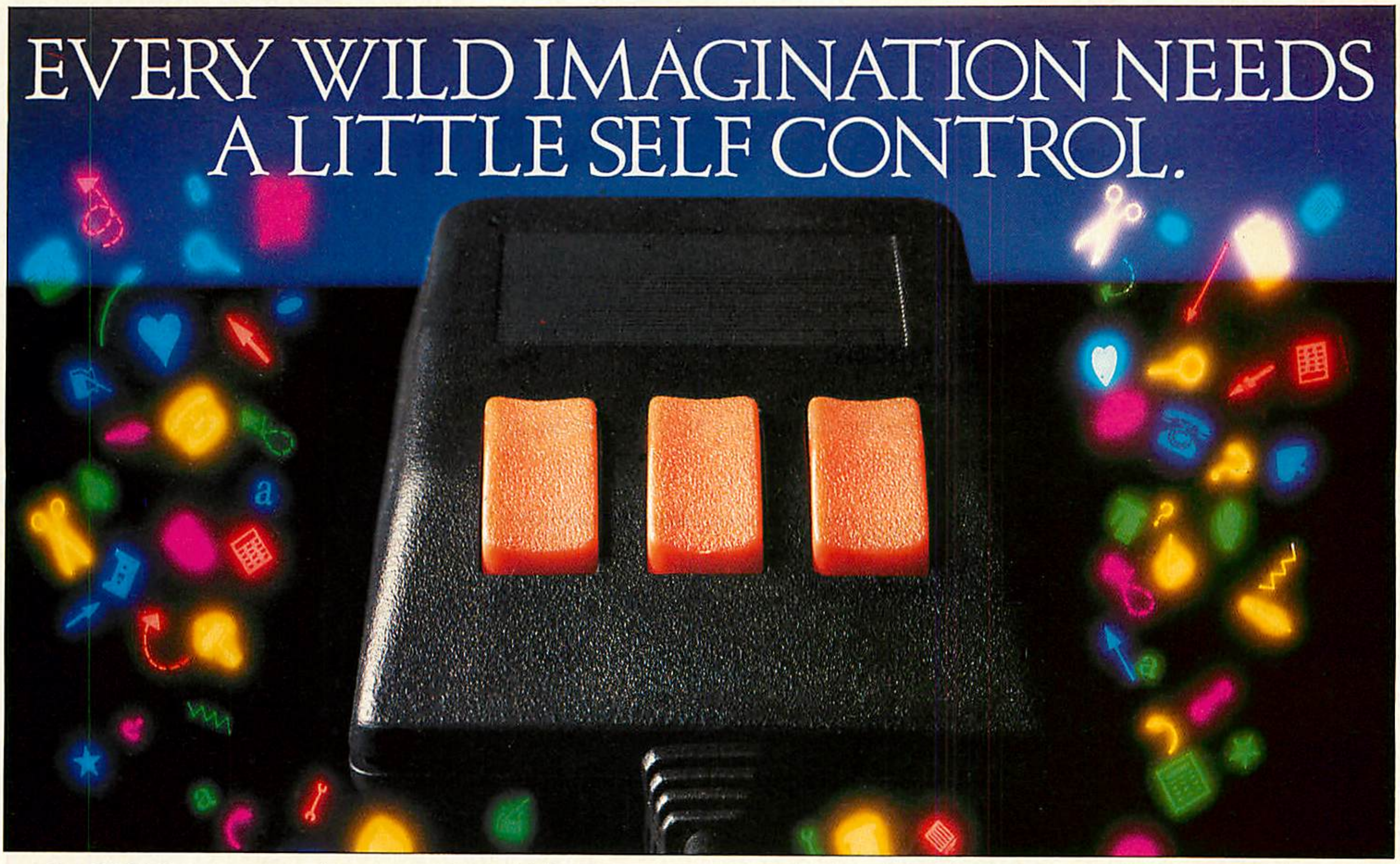
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As a BBC Micro user, you enjoy some pretty sophisticated equipment.

So it's a pity if you are still missing that sophisticated, positive control your equipment deserves.

There's not much joy in a joystick, and keyboards can be all fingers and thumbs. Frustrating, especially when your imagination is much faster than your fingers!

What you need is an AMX Mouse.

Already thousands of BBC Micro users have adopted an AMX Mouse and wouldn't be without it.

We didn't claim it was 'the best input device'. The press said it for us.

In fact it has received outstanding critical acclaim, and no wonder!

The AMX Mouse brings to BBC Model B, B+ and Master 128 users, the same freedom and versatility which has, up to now, been the exclusive province of much more expensive computers.



In fact, it's no surprise that nearly all the new 16 bit 'State of the Art' computers now come with a mouse as standard. Proof, if proof were needed, that the Mouse is here to stay.

The AMS range of Mouse software includes, AMX Art, AMX Utilities, AMX Pagemaker, AMX Super Art/Rom, AMX Paintpot, AMX Desk, AMX Data Base, AMX 3D Zicon, AMX XAM.

There is also a growing list of programs available from other leading software houses, which utilize the Mouse, including, Colour Art from Watford, Mini Office II from Database, Novocad from Technomatic, Icon Master from Beebug, Compas Starter CAD system from British Thornton, CAD Soft from CAD Soft, Solidesk from Solidisk, and Mode 7 Art from Tubelink and of course View and Wordwise are also compatible, many more titles will be available soon.

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ISSUE No 52 NOVEMBER 1986

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FEATURES

COVER



Cover illustration by Jonathan Inglis, using the *Super-Plot* program presented in this issue

NEXT MONTH

Castle of Nightmares – a great game in type in

Using *View* – start of a new series

Compact – personalising the software

The best games – round-up of the year

Red Boxes review – practical control in the home

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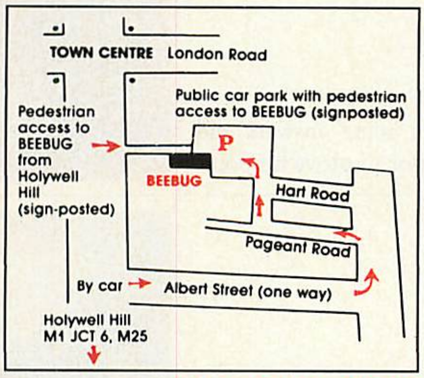
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199G	Compact Entry System	431.25	409.69
200G	Master 128	468.42	445.00
202G	Master ET	368.00	349.60
230C	65C102 6502 "Turbo"	119.00	113.05
231D	80186 Co-Proc	395.00	375.25
234B	M128 Econet Module	48.87	46.43
235B	M128 Eprom Cartridge	15.18	14.42
240C	M128 Manual 1 ADJ22	14.95	14.20
241C	M128 Manual 2 ADJ23	14.95	14.20
203F	'6502' 2nd Processor	207.00	196.65
204F	'Z80' 2nd Processor	335.80	319.01
205F	Acorn Prestel Adapt	134.00	127.30
206F	Acorn Teletext Adapt	144.00	136.80
237F	Acorn IEEE Interface	322.00	305.90
217B	1770 Disc Interface	48.87	46.43
218A	ADFS Upgrade	29.00	27.55
209A	1.2 DNFS Rom	19.50	18.53
207A	Basic II Rom	20.70	19.66
208A	1.2 Operating System	6.90	6.55
210A	A to B Upgrade Kit	69.00	65.55
212A	Acorn Speech Upgrade	46.00	43.70
226B	64K Upgrade Kit B+	39.00	37.05

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610F	Cumana CS100 40T	126.50	120.18
601G	Cumana CDX200 40T	215.00	204.25
602F	Cumana CSX400 40/80T	142.60	135.47
603F	Cumana CS400 40/80T	162.15	154.04
604G	Cumana CD800S 40/80T	286.35	272.03
614F	Cumana CS100E	118.45	112.53
615F	Cumana CS400E	155.00	147.25
222F	Disc Starter Pack	163.00	154.85
611A	Cumana Disk Guide	1.90	1.80
650B	Memorex discs SSDD 40	15.50	14.73
651B	Memorex Discs DSDD 80	25.50	24.22
652A	Memorex Disc Cleaner	9.65	9.17
653A	Disc Case 10 discs	2.25	2.14
654C	Disc Box -up to 50	11.99	11.39
656D	Lockable Disc Box 85	17.25	16.39

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311G	Kaga KP 810	248.16	235.75
304G	Epson LX 80	228.85	217.41
313C	LX80 Tractor Feed	22.42	21.30
315D	Cut Sheet Feed LX80	56.35	53.53
316G	Taxan KP910 15"	410.37	389.85
319G	Epson FX85 NLQ	368.00	349.60
320D	FX85 Tractor Feed	32.20	30.59
321D	FX85 Sheet Feeder	130.00	123.50
300G	Brother HR15XL Para	350.75	333.21
301G	Brother HR15XL Ser.	350.75	333.21
310G	Juki 6100 Daisywheel	362.25	344.14
309F	Ibico LTR1 NLQ	105.16	99.90
303G	Canon PJ1080A col.	520.00	494.00
308G	Epson JX 80 colour	520.00	494.00
318G	Epson HI 80 Plotter	368.00	349.60
400A	Platten Cleaner Kit	6.44	6.12
401A	2M Printer Lead	8.00	7.60
402A	Epson FX/RX80 Ribbon	4.00	3.80
403A	EpsonFX/RX100 Ribbon	5.00	4.75
408A	Canon/Taxan Ribbon	5.63	5.35
409A	Black Cart PJ1080A	7.19	6.83
410A	Colour Cart PJ1080A	9.99	9.49
413A	LX 80 Ribbon	4.60	4.37
414A	Ibico Ink Roller	4.60	4.37
415A	Epson JX80 Ribbon	16.22	15.40
418A	Juki 6100 S/S Ribbon	1.55	1.47
406D	11"*9.5" Paper 2000	14.03	13.33
453G	2-part NCR Paper	23.00	21.85

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437C	RX80/80FT Printhead	42.15	40.04
438C	FX100/105 Printhead	56.99	54.14
439C	LX80 Printhead	41.00	38.95

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502H	Kaga KX1203 Monitor	116.00	110.20
556A	Taxan 1201/2/3 BNC	3.90	3.70
503G	Zenith 123 12" Green	83.00	78.85
504G	Zenith 122 12" Amber	87.00	82.65
530H	Microvitec 1431 Mon.	208.15	197.74
531H	Microvitec 1451 Mon.	263.35	250.18
550A	1.0m Mon. Lead RGB	5.75	5.46
535H	Supervision III RGB	379.50	360.52
555A	Supervision Mon.Lead	7.00	6.65
570D	Stand for Supervisio	29.00	27.55
551E	Single Master Plinth	16.10	15.30
552E	Single Plinth	12.65	12.02
553F	Double Plinth	23.00	21.85

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213A	Watford DFS Rom+Man	26.50	25.17
214B	Watford DDFS Kit	52.90	50.26
216A	Watford DFS Manual	6.95	6.60
219B	Watford 1.43 DFS Kit	62.00	58.90
702A	Watford 32K RAM Card	66.12	62.82
709D	Watford Eprom Eraser	33.35	31.68
717A	Watford Sideways ZIF	17.83	16.93
736A	Watford 12 Rom Board	36.80	34.96
737A	Watford Battery	4.37	4.15
750B	Watford S/State 16K	32.20	30.59
751B	Watford 16K Module	32.20	30.59
753B	Rom/Ram Board 64K	67.85	64.46
754B	Rom/Ram Board 128K	102.35	97.23
755A	Write Protect Mk12	2.76	2.62
1120B	Watford TD Rom (SD)	28.75	27.31

OTHER HARDWARE

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701A	Aries B32 RAM Card	90.85	86.31
704A	ATPL ROM Board BBC	39.00	37.05
735A	ATPL Battery Backup	17.00	16.15
740B	Aries B12 Rom Board	46.00	43.70
749A	Aries B12C Adaptor	5.87	5.57
705A	2764 8K eprom	2.64	2.51
706A	27128 16K eprom	3.33	3.17
707A	6264 8K ram	3.68	3.50
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710B	Softlife Rom Blower	75.90	72.11
713A	Phone 2 in 1 Adaptor	6.30	5.99
714A	BBkey Labels	2.13	2.02
715A	Dust Cover BBC B/B+	3.45	3.28
734A	Dust Cover Master	4.60	4.37
716F	Music 500	94.41	89.69
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720B	Voltmace Delta 14B	12.50	11.88
721B	Voltmace Delta 14B/1	13.00	12.35
741A	Voltmace Delta ASC/B	8.50	8.07
742A	Delta Disc 40T	9.00	8.55
743A	Delta Disc 80T	9.00	8.55
762E	Beebug Magic Modem	95.00	90.25
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814A	Keyboard Connector	5.75	5.46
815A	65C02 CPU	13.80	13.11

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244A	Master PASCAL C.ROM	67.85	64.46
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1001B	Acornsoft View Sheet	44.28	42.06
1002B	Acornsoft Hi-View	44.28	42.06
1003A	Acornsoft Lisp Rom	41.40	39.33
1004B	Acornsoft BCPL	50.03	47.52
1005B	Acornsoft Comal	41.97	39.88
1006B	Acornsoft Logo	50.71	48.18
1007C	Acornsoft ISO Pascal	50.71	48.18
1008B	Acornsoft Basic Ed	28.00	26.60
1013B	View Print/Drive T.	8.62	8.19
1014B	View PrintDrive Disk	9.77	9.29
1015B	Acornsoft Revs Disc	17.08	16.22
1016B	Acorns Aviator Disc	17.08	16.22
1017B	Acornsoft GXR B	25.43	24.16
1018B	Acornsoft GXR B+	25.43	24.16
1019B	Acorns Viewstore Rom	44.28	42.06
1021A	Acorn Viewindex Disc	14.37	13.66
1022C	View 3.0 Rom	66.70	63.36
1024B	Acornsoft Revs Cass	14.00	13.30
1025B	Acornsoft Lisp Cass	10.35	9.83
1027C	Micro PROLOG	74.75	71.01
1028B	Pascal Generator	32.78	31.14
1029A	Revs 4 Tracks Disc	11.95	11.35
1030B	Acornsoft ViewPlot	25.30	24.03
1031B	Acorn Termulator Rom	31.05	29.50
1032B	Revs 4 Tracks Tape	9.32	8.85
1033B	Microtext Disc	55.20	52.44
1034C	Microtext Plus Rom	240.00	228.00
1035B	6502 Dev.Pack	45.00	42.75
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1038B	Database Disc	14.50	13.78
1039B	Creative Sound Disc	19.00	18.05
1040C	Micros Business Disc	47.27	44.90
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1042B	Acornsoft Forth Disc	19.00	18.05
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1111A	Hi Intersheet Disc	5.75	5.46
1112A	Hi Wordwise+ Disc	5.75	5.46
1117B	Interword	50.03	47.52
1114B	Interchart	29.90	28.41
1115B	Speech System TTS	30.99	29.44

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1151B	AMX 3D Zicon Disc	19.00	18.05
1153B	AMX XAM	19.00	18.05
1154C	AMX Pagemaker Plus	40.00	38.00
1155B	AMX Superart Rom	40.00	38.00
1156B	AMX Paint Pot Disc	10.99	10.44
1157C	AMX Mind Games Disc	14.50	13.78

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1126B	White Knight Cass	9.89	9.40
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1170D	Fleet Street 40T	37.95	36.05
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1172A	Mini Office II Cass	14.50	13.78
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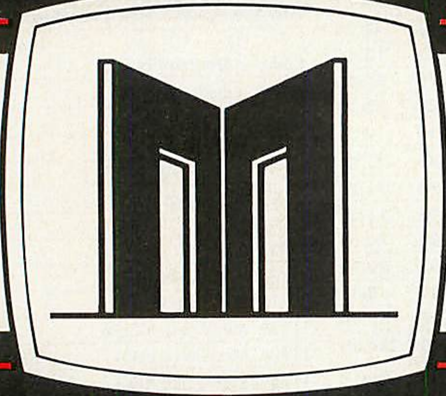
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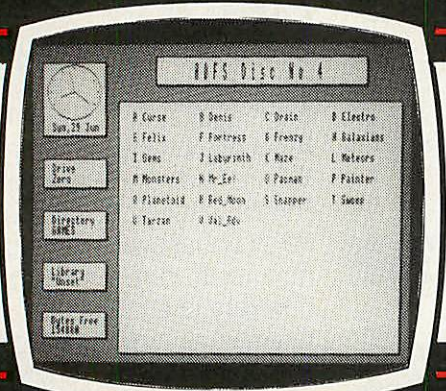
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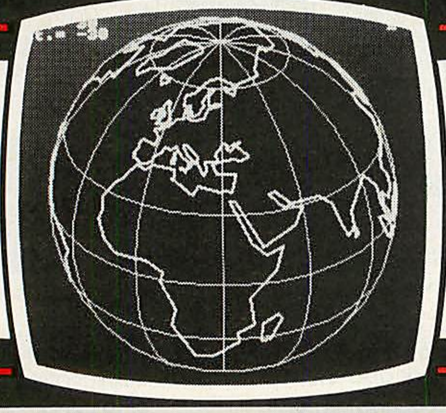
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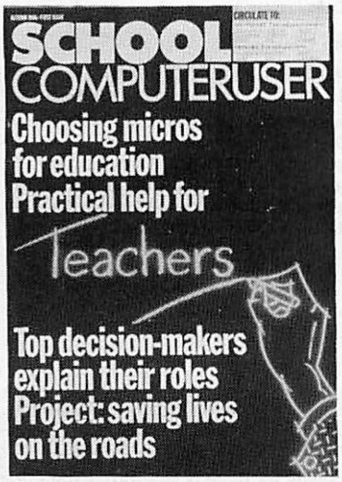
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NEWS



School computer magazine launch

A free computer magazine for schools has just appeared. *School Computer User* is produced by Redwood Publishing which also publishes *Acorn User*. The new magazine covers all micros used in schools.

The first issue, which has been sent out free of charge, has features on the future of computers in schools, how to choose a micro and a road safety project.

Contact your LEA computer adviser for a copy. Extra copies can be bought from Redwood (phone 01-836 2441).

News in brief

- A Prolog user group has been set up in Manchester. The initial aim is to promote micro-Prolog in schools. They also hope to accumulate a library of software. Contact John Ashurst, Micro Electronics Developments, Teachers' Centre, Barlow Moor Road, West Didsbury, Manchester M20 8PW.
- A Leicester bulletin board is in operation for BBC users. 'Sponge' operates at 300 baud between 6pm and 10pm on weekdays and 10am to 10pm on weekends. The number to ring is (0533) 778458.

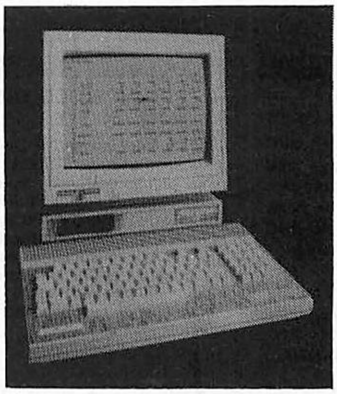
Italian Compact set for success

Acorn's Master Compact could become the number one machine in Italy under an Olivetti label. Only Commodore has a strong presence there at the moment, and its lead is already slipping.

The new Acorn micro is being sold by Olivetti and has been renamed the PC128S. It is aimed mainly at the home market, although Olivetti hopes to sell it to small firms too.

The business-like appearance of the machine is considered one of its strongest assets, along with BBC Basic. According to Giammarco Binetti, marketing director of Olivetti in Italy: 'It has a more professional look.'

The PC part of the name was carefully chosen 'to appeal to people who say they want to use it for serious applications'.



Compact: repackaged for Italy

Unlike the UK, the educational market is not strong in Italy. The government still has to decide what sort of technology to go for.

This change of emphasis is shown in the software which is being bundled. The Italian micro will not have the Logo language sold with the UK machine, but will have the *ViewSheet* spreadsheet in its place. The collection of desktop programs and utilities have been augmented by *Fontwise*, the printer utility produced by Clares. All the programs have been translated into Italian, and there will be a magazine called *Olivetti Prodest User*.

A new subsidiary company known as Olivetti Prodest has been set up to market and distribute the machine. The first batch of machines arrived soon after the launch and are already accounted for.

Acorn drops Scientific

Acorn has dropped the Master Scientific from its planned range of co-processors. Instead the company has improved the existing 32016 second processor which, it is felt, already offers a superior specification.

Bob Coates, marketing manager for Acorn, told us: 'We've hit some technical problems with the co-processor, and we've re-examined the market to find out what our customers want and are looking at the second processor now.'

There are good reasons for going for an improved second processor. For example, the co-processor would only have had 512k of RAM. For the type of applications most people want to run on this machine, one Mbyte is a more realistic figure. The second processor already has this. But the most convincing argument is that the market for this type of product is tiny, being measured in hundreds rather than thousands.

Improvements which have already been made to the second processor include an upgraded Panos operating system. The system also supports hardware floating point in Basic and BCPL now, which has greatly increased the speed of those languages.

The 32016 currently sells at around £1200.

Satellite packs aimed at schools

Unilab has released two satellite data receiving packages of hardware and software which it claims to be superior to other products in this market.

There are two versions for Uosat and weather satellites. Both contain everything required to enable a BBC micro to receive, decode, and display satellite data. Unilab will sell each pack for less than £220.

Unilab's David Duff said they are intended 'specifically for educational use', and have undergone extensive school tests. Further details from Unilab, Clarendon Road, Blackburn BB1 9TA. Tel: (0254) 57643.

NEW PRODUCTS

ADVANCED **P**RINT **B**UFFER is a program that runs in sideways RAM and provides a large printer buffer, instead of the resident 63 bytes. Large means over 14K (14 700 characters) allowing letters, reports, documents, listings etc. to be printed while you carry on with another task. Full control is provided to switch buffer on/off, purge buffer, even changing the effect <ESCAPE> has on the buffer (essential when using w/procs such as View) **(5¼ A/DFS) /B/M/C £5.95**

ADVANCED **E**LITE **FS** allows Master users to run their BBC Elite program disk on the Master or Master Compact **(5¼ ADFS) /M/C £5.95**

ADVANCED **BBC D**FS E00 enables B+ or upgraded B users to run 1770 DFS at @ E00 when used in 16K sideways RAM **(5¼ DFS) /B+ £19.99**

Advanced Computer Products

The following ACP products:
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Advanced 1770 DFS
are all Compact compatible

ADVANCED DISC TOOLKIT

(01) /M/B/E £34.50

Any Acorn user including Master, BBC B+, Electron, DFS, 1770 DFS, ADFS, 2nd. & co-processors A.C.P.'s BEST SELLING product containing over 30 commands inc.:- powerful memory & disc editor, search memory/disc/basic, catalogue/unplug ROMS, load/run programs below page, automatic menu, file transfer (inc. locked cassette files), ADFS utils etc. etc. ("it's superb" ... Database Pubs. - "excellent value for money" .. Acorn User) (16K EPROM & FULL MANUAL)

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A.R.A.1 (02) /E/ £10.35

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(05) /E/ £24.15

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(supplied on 16K EPROM + DFS MANUAL)

ADVANCED DISC INVESTIGATOR

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A very powerful Disc utility for standard & non-standard discs. Backup most protected discs, edit any type of non-standard disc, check & repair faulty tracks, create new disc formats, copy 40track discs to 80track discs, verify two non-standard discs.
("ADI features an extremely comprehensive sector editor, and one of the finest I've seen" ...Tubelink on Prestel)
(supplied on 16K EPROM + manual)

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(07)/M/B/E/ *£14.95*

A friendly utility for ROM & sideways RAM. Examine ROM/RAMs, load files into RAM, move memory to/from SWays ROM/RAM, catalogue/kill ROMS, offer commands to specific ROMS, save ROMs to disc/tape, AUTOROM a file (inc. BASIC) to run from SWays ROM/RAM, execute specific machine code subroutine in a ROM, generate a ROM's checksum & CRC.
ON ALL ORDERS RECEIVED AFTER 29TH AUGUST
(supplied on EPROM + manual)

ADVANCED PLUS 4

(08) /E+1/ £79.98

"DISC DRIVE COMPATIBILITY AT LONG LAST"... (Electron User June '86) this sums up AP4 & ACP's approach to producing products. AP4 is a fully ACORN compatible disc I/face & will accept any standard drive inc. PSU, runs 1770 DFS (as fitted in the B+ & Master), keeps page &Eøø, utils in ROM & provides a spare rom socket. "ACP's PLUS 4 comes out on top. I can recommend it to any-one..." (E.U. June '86)
...AP4 should be considered the standard inter-face for the Electron (AU July '86).
AP4 100 £198.97 (inc VAT & delivery)
AP4 400 £228.98 (inc VAT & delivery)

ADVANCED PLUS 5

(09)/E+1/ £66.70

A triple interface cartridge providing...
1) a TUBE i/face allowing a second processor to be connected, increasing BOTH speed & memory (PAGE &8øø HIMEM &8øøø in all modes)
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Also contains 2/3 ROM sockets and on board operating software for 2nd processor.

ADVANCED 1770 DFS

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ACP have totally re-written the Acorn 1770 DFS, enhancing existing features & adding new ones. The result is probably the fastest & most powerful disc filing system your computer could have. With the ability to operate in double density occupying both sides of a disc (640K). Automatic file relocation, improved file handling, 62 file catalogue and Sways RAM can be used as a fast RAM DISC.
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(14) /E+ASR/ £19.99

An alternative to our AED(05) for Plus 3 and ASR users. This optional alternative DFS is designed for use in Sideways RAM (ASR) and allows the user to operate a disc filing system &Eøø when using the Plus 3 (in ADFS page would normally be &1Døø). The DFS is simply loaded using the software supplied with the ASR from disc. (optional upgrade for existing AED users £9.50 on return of original EPROM) (3½" ADFS disc + manual)

OTHER PRODUCTS & SPECIAL OFFERS

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VIEW & VSHEET	(119)	/E+1/	£ 25.00	5¼" discs ss/sd	(122)	/M/B/E/	£ 8.99
LISP cartridge	(103)	/E+1/	£ 9.99	3½" disc drives	(please call for price)		
E/Adv User Guide	(104)	/E/	£ 4.95	5¼" disc drives	(please call for price)		
TURTLEgrhpCASS	(105)	/E/	£ 3.99	2nd. Drive Adaptor	(130)	/E+3/	£ 7.95
LOGO cartridge	(106)	/E/	£ 44.95	3½" library box 10	(124)		£ 2.95
PASCAL cartridge	(107)	/E/	£ 44.95	16K EPROMS	(131)		£ 3.75
VIEW pack BBC	(118)	/B/	£ 49.00	VIEWSTORE	(117)	/M/B/(e)	£57.95
AP4 100	(140)	/E+1/	£198.97	Acorn Plus 1	(150)	/E/	£39.95
AP4 400	(141)	/E+1/	£228.98				

Equipment codes /M/=Master /B/=BBC /E/=Electron /E+1/=Electron+Plus 1 /C/=Compact

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AB Designs' new software

AB Designs is to release new packages in ROM chip format compatible with BBC and Master to work with a Trackerball.

The first chip in the Microbrush Graphics System costs £68 and provides painting, screen editing and text facilities with 23 typefaces. The second chip, the £45 Injector, adds various utilities and comes with a disc of 30 extra faces.

Three extra discs available cover pixel editing (£30), screen dumps (£25) and the 30 typefaces (£30). The two chips with the extra discs cost £150 if ordered together.

Details from AB Designs, 81 Sutton Common Road, Sutton, Surrey.

Timefame falls out

Timefame, a popular Prestel database, has left the system after a row over its new contract. According to Timefame, the cause of the dispute was Prestel's insistence that independent information providers (IPs) could not run farming databases without joining the Farmlink closed user group (CUG).

Timefame's database was wide-ranging, covering everything from business to hobbies. Although it had no agricultural section, the company felt that it could not accept the sort of limitations which Prestel wanted to impose on the service it offers.

However, it has been suggested that Prestel is trying to squeeze free databases out of the system — an accusation made when Viewfax and Micronet were forced into Prestel Microcomputing two years ago. CUGs charge a subscription for their services. And Timefame's boss, Roy Norman, seems to feel that the Farmlink business may be the thin end of the wedge.

However, Mike Abbott of Prestel insists: 'We're not putting any pressure on information providers to join closed user groups.

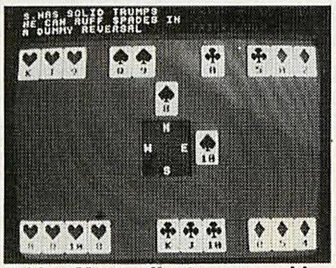
'It's true that we've introduced a new clause into all IP contracts concerning farming databases. But it doesn't prevent them from setting up farming pages. It just requires that they consult with us first.'

Referring to Farmlink: 'We simply want IPs with farming information to provide routes into Farmlink and for Farmlink pages to be able to route into the IP database.'

It has been rumoured that Timefame is to set up its own public database system, and that it may even be joining Teletel — the French version of Prestel which is setting up links in this country. However, David Lisbona of Aldoda International, who is handling Teletel business in the UK, denied all knowledge of this.

The row comes just as Prestel is facing stiff competition from Telecom Gold among home micro users.

Bridge update



Bridge Mentor II: strong graphics

The new version of Minic's bridge program should give even quite experienced players a run for their money.

Bridge Mentor II (Master-compatible) uses strong graphics combined with a high level of skill to make it an ideal teaching aid. Details from Minic Business Services, 12 Woburn Close, Bushey, Herts.

Umusic launch

Umusic has launched a new 16-channel MIDI sequencer, the UMI-35 at £195. It is a follow-up to the company's highly successful UMI-2B system. For details contact Umusic at 17 Parkfields, London SW15 6NH.

Compact Artroom

Clares has produced the first software package aimed specifically at the Master Compact.

Artroom is a graphics package specially designed for the new Acorn micro. The program, written by *Fleet Street Editor* authors Jon Warmisham and Frank Dart, allows you to produce high quality drawings and dump them to a printer. It is being sold by Olivetti in Italy, but Clares is handling its own distribution and sales in this country.

The program comes as a ROM image, and the drawing fills the whole screen. The whole thing is icon-driven and costs £27.

Clares has also converted most of its other titles. *Ramrod, Macrom, Brom Plus, Fontwise Plus* and *Beta-Plus* are all available on 3.5in disc. In the case of the first three, and *Artroom*, the software is also available on ROM.

Contact Clares Micro Supplies at 98 Middlewich Road, Northwich, Cheshire CW9 7DA. Tel: (066) 48511.

Computing back on the air

Computing is back on TV in a big way with several new series from the BBC.

Micro Live returns to BBC2 on October 17, with Radio 4's series on computing and communications, *Global Village*, starting on October 24.

New series are also planned for schools. *Wondermaths* began in September with ten short mini-dramas, set on a spacecraft. These will be followed up with a series of five programmes next year about programming in Logo.

Another schools series called *Technology and Design* combines radio and television to look at methods of problem solving, including the use of computers.

BBC package for modems

BBC Soft has released a terminal software package for modem users combining professional power with a pocket money price. *Modem Master* is supplied on disc for only £12.95. The software allows the user of any modem to access Prestel and other page-based viewdata services and scrolling text bulletin board services.

It has separate 'modem drivers' with a common terminal software core so all 'intelligent' modems, with autodial and so on, can be used to the full. Phone 01-580 4682.

Paintmaster

Page 107 of September's issue carried an offer for a graphics cassette with a painting program devised by Mr Rob Fenton. In fact the colour illustration was produced using the *Paintmaster* program developed by D J Fowles. We apologise to Mr Fowles for the error.

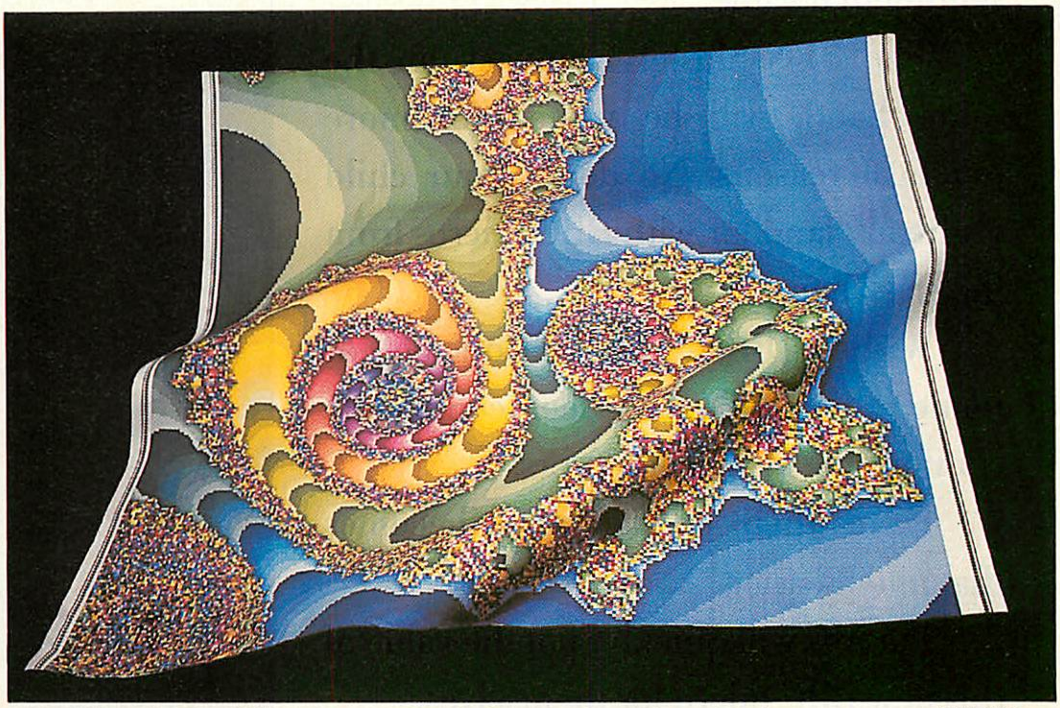

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Mandelbrot exploration madness

When we invited you to send in interesting screens generated by the Mandelbrot Plot program in the May issue we expected a few discs and the odd black and white Epson printer dump. Chris Dodkin went right over the top with this full colour poster-sized print-out. Chris is in the fourth year of an Information Technology sandwich course at Leicester Polytechnic. For the past year he has been writing software on an IBM 370 mainframe computer at the government's Rutherford Appleton Laboratory.

Chris said he has enjoyed the complex maths-based graphics programs in *AU* and has spent many hours exploring the Mandlebrot set on the screen of his BBC micro.

To further his Mandlebrot exploration Chris used a version of the program on the IBM 370, equipped with a Versatec electrostatic ink pen printer used for chip design – a system worth more than £500,000. This would calculate the set in about 20 seconds and produced this 3.5ft by 3.5ft dump in only 10 minutes.



This 3.5ft by 3.5ft Mandelbrot dump produced using a version of Acorn User's program on an IBM 370

Big Ben's day out

The Dutch Acorn user group, the Big Ben club, will be holding its fourth 'yearly day' on 18 October – and *Acorn User* will be there. The venue is the Community Centre in Hedel, north of 's Hertogenbosch in the Netherlands. There will be presentations on education, wordprocessing, genealogy and communications from the group.

Entrance is free for Big Ben members and 5 guilders to non-members. Further details from the Big Ben Club, Gommerskerspel 24, 2151 RA NIEUW VENNUP, Netherlands. Tel: (31) 2526-72385.

Graphics package is based on Master

A Master 128 is at the heart of a new 16-bit professional graphics workstation. The Acorn micro is used to control a co-processor based on an advanced Hitachi high resolution graphics chip.

The system is aimed at graphic design studios, TV and video production companies and even the design departments of school and colleges.

The Hitachi chip is part of the Prisma 2 graphics board giving 4096 colours and a resolution up to 832 by 576 pixels. There are full 'genlock' facilities so the pictures can be fed directly to a video system. Alternatively you can use a printer, plotter or screen camera to get a hard copy.

Up to four full screens can be held in memory at once, or you can define anything up to 1100 windows! Switching between windows and screens can be done at frame rate making smooth animation very easy.



Master-based graphics station

The Master, graphics co-processor, complete with one megabyte of screen RAM and supporting hardware are housed in a special case, which also has a 9in mono monitor and twin 3.5in disc drives. With it you get an IBM-style keyboard and a high quality graphics tablet.

It will run programs produced for the Compact and this means the package can be used for wordprocessing and accounts as well as graphics.

The price is £5200 plus VAT for the hardware. There is also CAD software available for £450. More details from Cadsoft Computer Graphics, Pound Cottage, Upper Wield, Alresford, Hants SO24 9FT. Tel: (0420) 62784.

Basic booster for Master 512

A superfast Basic with enhanced graphics facilities is now available for the Master 512 micro.

Locomotive Systems, which produced the Mallard Basic bundled with Acorn's Z80 second processor, has produced the new language for all machines capable of running Gem under DOS or DOS Plus.

Known as Basic 2, its main feature is speed. But even though it uses no line numbers it is still an interpreted language. Commands such as GOSUB are handled using labels. You can use line numbers if you wish, but the numbers are effectively treated as short labels, which means you can have them in any order.

The language gives full access to all the Gem graphics facilities, and is especially good at handling windows and mice. Basic 2 also contains commands for handling serial and random access files.

The price is £99.95, or £165 with Gem. More details from Locomotive Systems, 1 South Street, Dorking, Surrey.

Two things your fi



Good old Teddy will always have great sentimental value.

The BBC Master Compact, on the other hand, will be valued for more practical reasons. No doubt your child is already familiar with BBC micros from the classroom.

With a BBC Master Compact at home, they will soon feel completely comfortable using computers.

From then on, learning becomes that much easier.

Parents will quickly spot the value of this new BBC micro for themselves.

Once your child is safely tucked up with Ted, you might use the Master Compact to do the dreaded VAT returns.

Accountancy Age has already acclaimed our micro's spreadsheet package* as 'the most sophisticated yet produced for a small micro.'

The BBC Master Compact comes as a complete, easy to use package. This includes colour monitor, processor, disc drive and enough software to keep you and your children occupied indefinitely.

It is now available from selected branches of Currys, Dixons, John Lewis', Laskys, W. H. Smith and your Acorn dealer.

Like a Teddy Bear, it can be justified as an essential purchase.

THE MASTER COMPACT 128K RAM, 3.5" DISC DRIVE, PRINTER AND JOYSTICK INTERFACE, SOFTWARE INCLUDES VIEW WORD PROCESSOR, ABC, CARD INDEX, LOGOTRON LOGO, WINDOW DRIVEN DESK-TOP SYSTEM, ADVANCED DISC FILING SYSTEM, 14 PROGRAM WELCOME PACK AND 4 TUTORIALS. *SPREADSHEET EXTRA AT £52. BASIC PRICE £399. WITH MONOCHROME MONITOR £469. WITH HIGH RESOLUTION (0.42 PITCH) COLOUR MONITOR (AS ABOVE) £599. ALL PRICES PLUS VAT. FULL DETAILS FROM BOB COATES, DEPT (AU2), ACORN COMPUTERS LTD., CAMBRIDGE TECHNOPARK, 645 NEWMARKET ROAD, CAMBRIDGE CB5 8PD.

Compact

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	HR15 Corr	£2.90	£2.50	£2.30
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	HR15 MS	£3.50	£3.00	£2.80
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M/TALLY	MT80	£4.00	£3.20	£3.00
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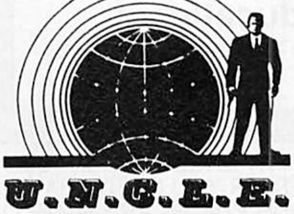
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Ac.U.11/86

THE MAN FROM U.N.C.L.E.



Where is he? Who's got him? If there are any gangsters out there who are holding him, I say set him free. Uncle Clive is a kind, caring person and it's not right to deprive him of his liberty. If there's a ransom involved, I haven't got any money, but there is my bike (six gears) and my signed photo of David Coleman.

Of course, he could just have wandered off, dazed by his great efforts in the field of VLSI (very large scale integration) circuitry. After months of toil on his new project – a hearing aid for the short of breath – somebody told him that VLSI didn't mean what it sounded like.

The idea is to make things as small as possible. I did try cheering him up by reminding him of the enormous production and development costs he would save by not having to provide a pantechnicon van with each appliance, but a funny look came into his eyes and he started muttering to himself. Something about Official Receivers and their peculiar personal habits.

We went down to the pub for a few Boilermakers but he wasn't very good company – shouting at the new barmaid when she said you don't normally get a cherry with beer. He started hitting the hard stuff. Pink Ladies and that sort of tackle, and the last I saw of him he was deep in conversation with the pool cue rack. The rest of us went for curry and chips but he said he wasn't going to leave his new friend in that condition. You don't think that's who kidnapped him, do you?

Plus for all Electrons

Electron users will soon be able to run *Wordwise* +, as long as they have a PMS second processor fitted. *Wordwise* + from Computer Concepts is one of the most popular word-processors, but until now has been available only for BBC micros.

Derek Mathieson of Permanent Memory Systems has modified the Hi version of *Wordwise* + so that it will work with a mode 6 screen.

The new version runs on the company's E2P-6502 second processor. As a result, there is 42k of memory available with this version, which means it is capable of handling approximately 8000 words.

The preview mode, where you see what the text looks like when printed, is always in 80-column through mode 0. This is because the screen memory is handled by the Electron while the second processor takes care of the text. (Normal versions of *Wordwise* resort to a 40-column mode when half full because of memory limitations.)

To make the software as similar as possible to the original *Wordwise* + the mode 6 character set has been redesigned to make it resemble mode 7. The invisible 'green' and 'white' markers used to define embedded commands have been replaced with inverse G and W characters, and the START and END markers are also inverse.

PMS said Computer Concepts was fully behind the new product, although it will be marketed PMS. The software is compatible with most of the popular interfaces and add-ons, including the Plus 3, the Cumana Disc Interface, AP-4, Slogger ROMBox+ and Turbo.

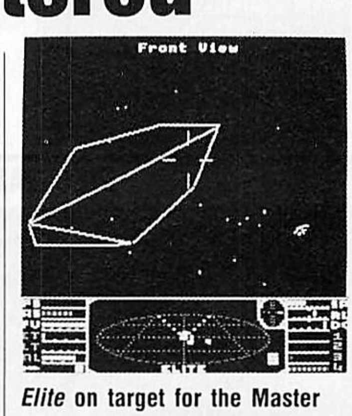
The package was expected to hit the streets soon, although no price had been announced as PMS was still negotiating a contract with Computer Concepts. However, it is expected that the price will be similar to the original product, at around £45. Unlike the original, however, the PMS version will be made available on disc and cassette rather than ROM. The E2P-6502 second processor costs £89.

Full details from PMS at 38 Mount Cameron Drive North, St Leonards, East Kilbride G74 2ES. Tel: (03552) 32796.

Elite Mastered

Elite fans annoyed that their favourite game will not run on the Master can now play to their hearts content thanks to Advanced Computer Products. The Advanced Elite Filing System will enable the Master to run the old incompatible *Elite*. The AEFS costs £5.95. Contact ACP, 6 Ava House, High Street, Chobham, Surrey, GU24 8LZ. Tel: (0276) 72046.

Meanwhile, Acorn has released a new *Elite* disc with all the various versions on it for £19. The disc contains the original disc *Elite*, the Master-compatible version and the Master Turbo super *Elite*. Contact Acorn, Fulborn Road, Cherry Hinton, Cambridge, CB1 4JN. Tel: (0223) 245200.



***Elite* on target for the Master**

Call for single sex classes

Single sex classes in computer studies are being urged by the SDP-Liberal Alliance to ensure that girls don't miss out. The move follows reports that girls in mixed schools are discouraged from studying computing, maths and sciences.

Past research has shown that in mixed classes boys tend to dominate in the competition for 'hands-on' experience at the keyboards. There has also been a tendency to direct girl pupils away from science and technical subjects towards the arts.

Now the Alliance claims it is time to end such discrimination against girls by ensuring they can be taught without 'aggressive competition' from boys.

The proposal is included in a new 'green paper' on women's rights drawn up by a working party of Liberals and Social Democrats.

Drum machine for the BBC

Rice Computers has released a drum machine add-on for budding Beeb-owning percussionists. The Rice Drum Machine connects to the user port and has a single audio output. Software allows you to program and edit rhythm sequences with eight percussion voices of bass drum, toms, hi-hat, snare and so on synthesised from stored waveforms. The Drum Machine costs £45 with software on cassette and £47.50 on disc.

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AMSTRAD

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MESU head stresses use of micros as tool in schools

John Foster, director of the Microelectronics Support Unit, answers the questions posed in the Education News column of October's *Acorn User.* Those questions reflected opinions and concerns felt by practising teachers and by others involved with the integration of microtechnology into the curriculum. Mr Foster's answers are in response not only to those general issues but also to more specific topics outlined in the questions below. The questions are asked by Nick Evans.

NE: Can you outline the aims of MESU in the next year?

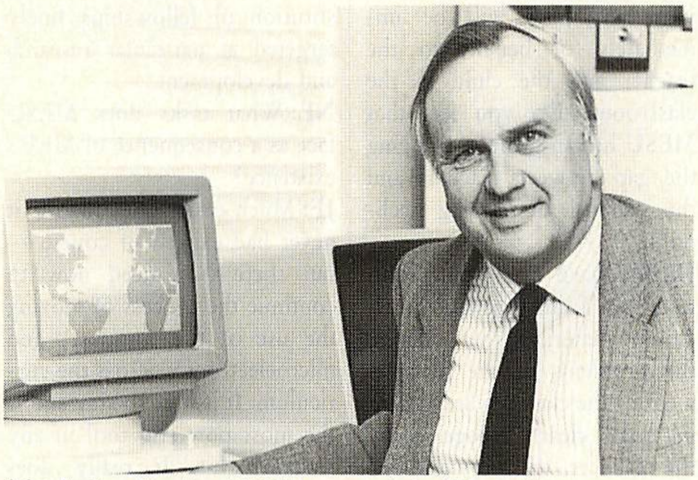
JF: I intend that staff from MESU should start to get to know every LEA and initial teacher training institution, subject association and advisers grouping across all subjects and phases of education. This is in order to take 'briefs' from them about their perceptions of need within their particular area and

I have no wish to disassociate myself from MEP since I was very much concerned with it

to help put people in touch with people. From this will develop papers for the MESU board on recommendations for priorities for action.

At the same time we shall be running seminars here in Warwick University and elsewhere for pre- and in-service trainers. These will be workshop seminars to give them an opportunity to update on software, materials and strategies that are available and to advise us on their needs in the light of this.

We will be starting on the revision, versioning and building-around of the materials produced by MEP. Sometimes this will just require a reprint (many materials have been out of print for some time). In other cases there will be a need for additional materials and/or software.



John Foster, director of MESU, responds to *AU* questions

We shall also build our links with the media and with other people's on-line databases to ensure that information comes to the education community, government and the public in as many forms as possible so that there is a diversity of ways that people can find out what is going on, what is available and from where.

MESU also intends to let contracts for major curriculum development activities to produce materials over a two to three year time scale. The initial contracts are likely to be for the most obvious priorities as outlined earlier. These will include materials that help in the transfer from activities in the primary school to those in the examination years of the secondary school; also putting some flesh onto the sometimes rather ambiguous statements about it (information technology) content in GCSE syllabuses throughout the curriculum.

NE: What longer term aims do you have?

JF: More of the same, as in my first answer, building towards a state where the computer is used throughout the curriculum without teachers feeling that its use should be heralded with a fanfare of trumpets — or an apology! In-service courses will not be for example 'The Computer in the Teaching of Geography', but general courses in geography teaching will come to include the computer where it is a relevant aid or tool as a matter of course.

NE: As an institution based in a university do you not think there is a danger of becoming separated from the grass roots of the classroom? Is this not even more true now that the operation has condensed into a single base?

JF: Our base, similar in nature to MEP's Newcastle Polytechnic base, gives us enormous advantages. The Institute and Faculty of Education are happy to comment professionally on what we do and to join us in educational debate as well as making available their facilities. Moreover, being condensed into a single base allows the informal transfer of information between members of my team that was missing in the dispersal that was MEP.

NE: MESU will take some time to gain momentum — how do you see the organisation coping with the problem of setting up shop after the local authorities have had a long *inter regnum* in which they have had to fend for themselves in terms of training?

JF: One of the objectives of MEP was to hand over Regional Information Centre activities to the LEAs by the end of their project. A lot of the energies of MEP went into helping the LEAs prepare to 'go solo'. In addition, the computer advisers now have their own professional association, NAACE, which provides mutual support between LEAs. Add to this the splendid packs produced by some of the MEP teams for

MESU intends to let contracts for major curriculum development to produce materials

in-service work and you have a structure that already has its own momentum.

NE: What value do you think MESU can gain from the remnants of MEP in terms of people, projects and enthusiasm?

JF: Some of the MEP staff will join my staff. Others may well be prepared to be brought in on a consultancy/training basis. I hope they will also be involved in the project contracts as their experience and expertise is invaluable.

NE: MESU has put out feelers

Contined on page 18 ▶

MESU head on micros in schools

● Continued from page 17

NE: MESU has put out feelers for projects from the LEAs. Do you feel those projects are best gleaned through the advisory staff or would you see an interface directly with practising teachers?

JF: Our projects will have local steering committees or advisory panels that will include my staff and local teachers. It is sensible that advice should also come from an LEA's advisory service and from subject and professional associations rather than from MESU direct. We will keep these organisations informed and there will, I hope, be dialogue between us so that they can then interpret what we say to fit in with local plans and policies.

Anyone can write in with ideas but projects for a 'tender' need a supportive infrastructure and this is unlikely unless the teacher(s) concerned have the active support and approval of the LEA. It is also a condition that more than one LEA should enthusiastically support the bid.

NE: What projects or plans do you have that will be immediately of benefit to the teacher and the child in the classroom? Do you feel that MESU has any role in bridging the gap between teachers and the rapidly developing technology?

JF: We have no instant solutions but I am sure that curriculum materials that address the problems of the management of the class towards learning goals, clearly recognised by the teachers, will be welcomed when they start coming off the production line.

NE: Whereas people realise that MESU is not an MEP clone, how will the organisation disassociate itself from the MEP role without causing alienation of those who wish to see MESU pursue a more developmental role?

JF: I have no wish to disassociate myself from MEP. I was very much concerned with it. The developmental role will be continuing, albeit in a rather different way, through the institution of fellowships finely targeted at particular research and development.

NE: What tasks does MESU face as a consequence of MEP's existence?

JF: Much easier ones than if it never had existed of course — but there is a need now to continue the process of moving the use of the computer and microelectronics across the curriculum. It is here to stay and is the most powerful tool in any teacher's kit. It really does allow children to perform above our expectations of their ability and cannot be ignored.

NE: The projects, books and software, as well as the information collected by MEP, is seen as a valuable resource. Who is responsible for those materials and where may they be obtained now?

JF: Richard Fothergill (director of CET) and I are looking into the problem of who does what. The copyright of MEP items was with CET. Some of it has been let to publishers. Other items, like Anita Straker's Primary Packs, we must get back into print as soon as possible and either CET or MESU will be doing that soon. The problem is addressed, but the plan is not yet decided.

NE: Will MESU provide regular bulletins on its progress and if so, where will they be published?

JF: Yes. Everywhere we can get column inches and air time.

Acorn User will keep readers up to date with significant progress in MESU's development.
CET, 3 Devonshire Street, London W1N 2BA.
MESU, Advanced Technology Building Science Park, University of Warwick, Coventry CV4 7EZ.

BLUNDER BOX

● There were couple of errors in Mike Rawlings' 'File it sideways' article in September's issue. In the paragraph headed 'Testing the program' on page 104, the first maximum file length displayed should have read &1DD1 instead of &1DBC and the second should have been &1D8B not &1D76. Line 2470 of listing 1 should read: 2470 PROCequs ("Romfile: "). Also missing from the yellow pages were listings 2, 3 and 4 which are printed below.

Listing 2

```
10 DIM b 20
20 REM Initialise PROC
test
30 z=0
40 PROCtest
50 z=10
60 PROCrom("SUB1")
70 PROCrom("SUB2")
80 PRINT"MAIN PROGRAM"
90 PROCtest
100 END
110 :
120 DEF PROCrom(a$)
130 *FX3,6
140 *ROM
150 PROCoscli("LOAD "+a
$+" 1100")
160 *FX3,0
170 PAGE=&1100
180 GOSUB z
190 *DISC
200 ENDPROC
210 :
220 DEF PROCtest
230 IF z=0 ENDPROC:REM
Ignore if z=0
240 PRINT"PAGE=&";~PAGE
250 ENDPROC
260 :
270 DEF PROCoscli($b)
280 X%=b MOD 256
290 Y%=b DIV 256
300 CALL &FFF7
310 ENDPROC
```

Listing 3

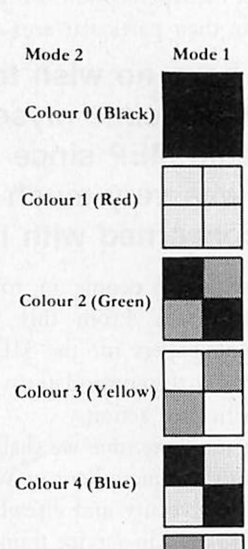
```
10 REM UserRAM only
20 *KEY10CH."MAIN"|M
30 REM Bank number 14
40 *RLOAD SUBS 14
50 CALL&D9CD
```

Listing 4

```
10 REM Solidisk only
20 *KEY10CH."MAIN"|M
30 *FX151,98,15
40 REM Bank number 14
50 *FX151,96,14
60 *SUBS
```

● 'Controlling the cursor' (*AU*, August, page 57) doesn't work on the Electron as stated because the Elk has no 6845 video control chip.

● A few mistakes slipped into Phil Wilkes' article 'Art to Art Conversion' last month. On page 88 for 'O.MODECON' read 'CONVERT'. Also on the same page, the text concerning listing 2 refers to entering the initial screen name and mode and final screen name and mode — this information should be typed directly into the program. Finally figure 2(b) on page 91 should be as shown on the right.



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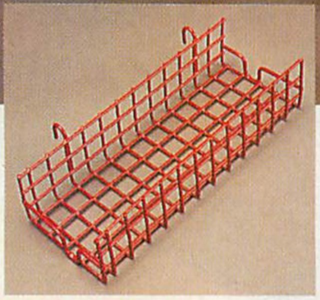
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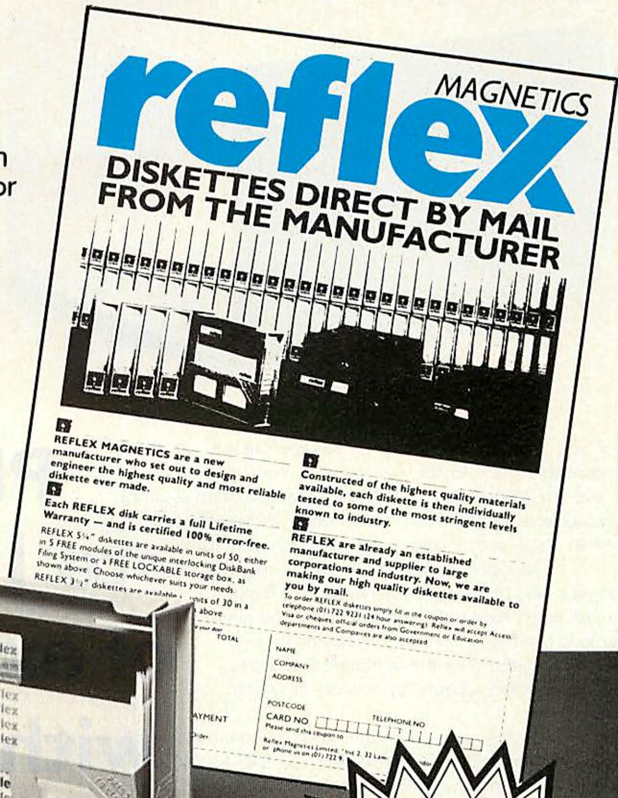
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3. Winchester user guide.

4. Additional utilities on the winchester including formatter, verifier, ADFS menu and backup programme.

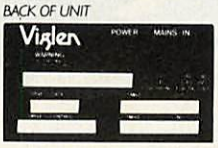
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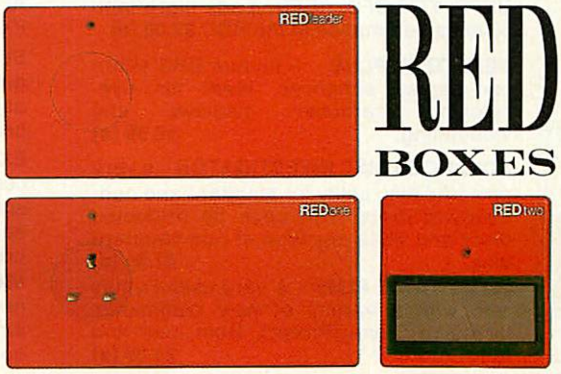
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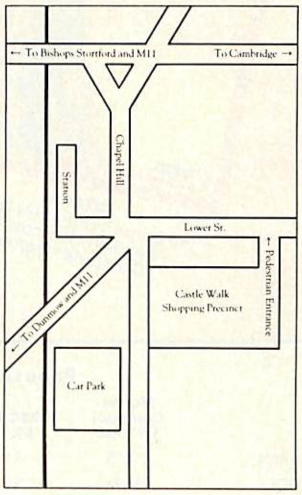
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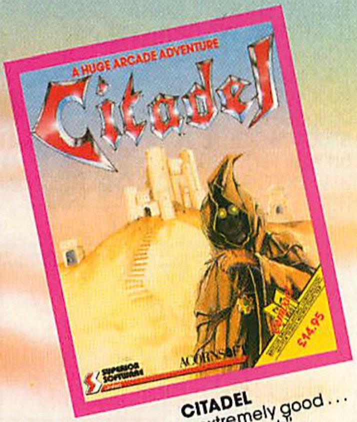
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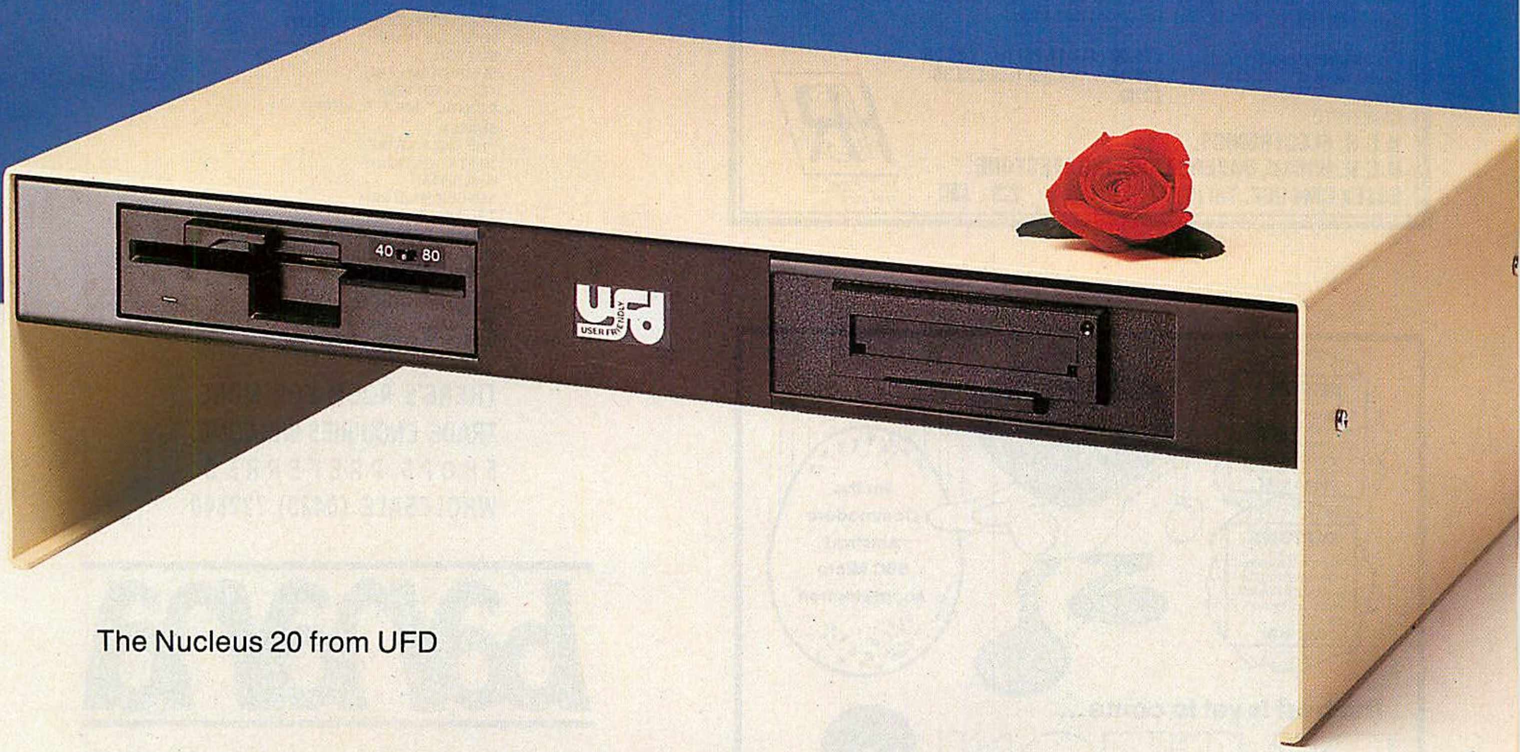
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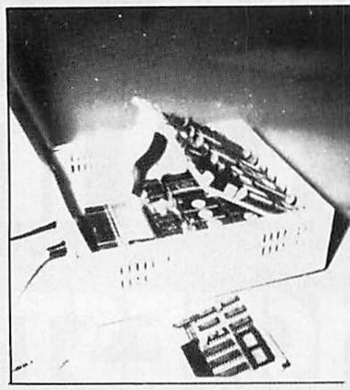
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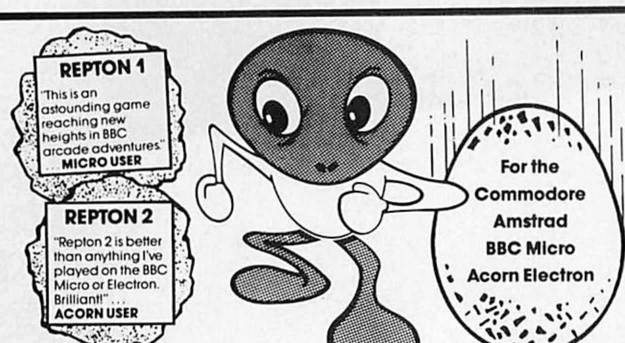
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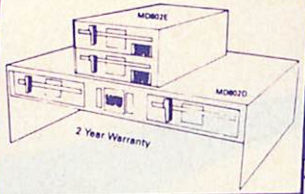
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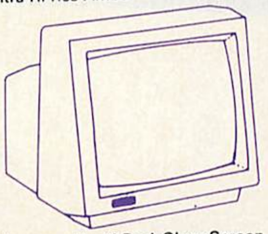
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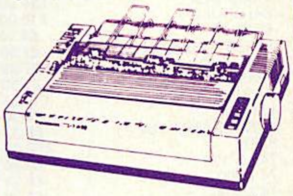
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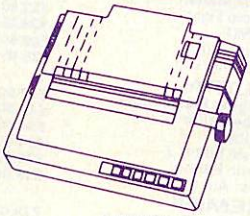
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* PRINT SPEED, DRAFT: 100 NLQ: 20 COMPRESSED: 86
* 9 PIN PRINT HEAD



The Panasonic PX-P 1080 impact dot matrix printer is ideal for applications that require economical high quality printing. It offers a variety of print modes, all producing crisp clearly formed characters. Wide choice of print sizes includes semi -compressed and compressed (even in near-letter quality printing). Operator accessible print mode selector adds convenience. For a reliable printer at an affordable price, the KX-P 1080 is always a smart choice. **£159.00**



NEW

STAR NL-10
Fine Near-Letter-Quality, 100% compatibility and total reliability all in one easy to use printer. For quality, ease of operation and dependability, nothing beats the Star NL-10. You get outstanding print quality at 120 cps in draft mode and 30 cps in near letter quality. Plus, the sleek NL-10 offers full compatibility with most popular computers through plug in interface cartridges. Just insert the appropriate plug in interface cartridge for your IBM-PC, Commodore, Apple IIc or other parallel computer and your Star NL-10 is ready to print. Touch a button on the control panel to set the print pitch (3 choices), to select the typeface and to print in either draft or NLQ mode. You can even set left and right margins, make top of form settings and control forward and reverse feed in the smallest pitch. **£229.00**

KAGA KP810
The 80 column printer with 140 CPS Draft and NLQ with friction and built in tractor feed offering 9 INT character sets. Long life cartridge ribbon and standard centronics interface. Fully compatible with Epson FX80. Designed and made by Canon. The office people. **£239.00**

ALSO AVAILABLE

Epson FX 85	£365.00
Epson FX 105	£495.00
Seikosha GP 50A (Parallel)	£69.00
Seikosha GP 50S inc. Printer I/F + cables	£69.00
Canon PW 1080A (NLQ)	£249.00
Canon PW 1156A	£379.00
Brother EP 44	£228.00
Shinwa CP 80A	£189.00
MP 165	£240.00

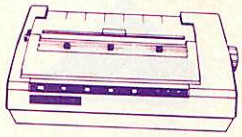
DAISYWHEEL PRINTERS
QUENDATA DWP 1120
with optional tractor/sheet feeder and 13" paper width facility. This Daisywheel printer with 20 CPS has 96 character printwheel compatible with the QUME. Standard centronics interface.

(optional RS232 C)	£169.00
Juki 6100	£285.00
Juki 2200	£275.00
Juki 6300	£799.00

BROTHER HR 15 XL
New improved Brother printer. 20cps with 3K buffer built in as standard. Supports proportional spacing. Comes standard with centronics interface. (RS232 optional) Sheetfeeder, tractorfeed and keyboard also available. Special introductory price. (inc. VAT) **£299.00**

RICHO RP1200 N
25 cps High quality daisywheel printer. Standard parallel interface. Fully IBM compatible. Will support underlining double strike and bold facing. Priced at only **£249.00**

NEW



TECO VP1814
Dot matrix printer. VP1814 is fast highly reliable and easy to operate.
☆Standard 80 column
☆The high-speed, low energy consumption 9 wire dot head gives printing speed of 180 cps and NLQ speed 36 cps
☆Bi-directional, Logic seeking in text mode
☆The use of fan-fold, roll or cut-sheet paper is possible with adjustable sproket pin feed and friction feed
☆Offers emphasized, double print, super script, sub script
☆Justified print mode are also available including left, centre, right and full justification
☆9 graphic modes are available
☆Both download and inprint buffer can exist simultaneously
☆7K input buffer standard can be expanded to 15K
☆Printing modes selectable at front panel (NLQ/draft, Pica/Elite, enlarge, emphasize, condense, italic
☆11 Language international character font is internalized
☆Both IBM and Epson compatable
MAIN UK DISTRIBUTOR
SPECIAL INTRODUCTORY PRICE
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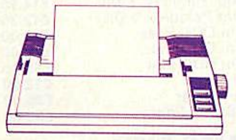
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Juki 5510 - Gives you 180 CPS & NLQ Standards
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BROTHER M1109 NLQ
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KP 910
Same specifications as above. 17" wide carriage 156 column. Special limited offer **£379.00**



EPSON LX86
High performance low on price offering an increased performance at an incredible low price. The LX 86 Dot Matrix Printer represents unprecedented value for money, with a host of built in features, increased draft speed 120 cps and correspondence quality at 16 cps printing this versatile Epson printer carries out every task with effortless style and has the highest standard of reliability. Supports both Epson and IBM character set. (inc VAT) **£229.00**

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24 Pin Dot Matrix Printer offers a high 200 CPS draft speed and near letter quality at 67 CPS with high resolution graphics and a variety of fonts **£585.00**

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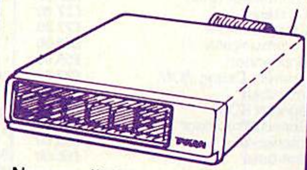
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Juki 6300	£129.00
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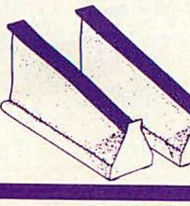
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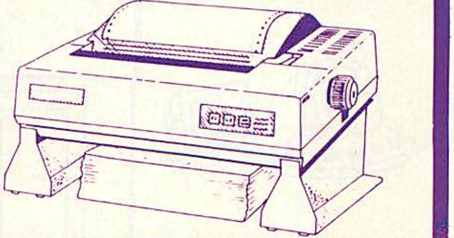
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GRAPHPAD 2

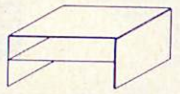
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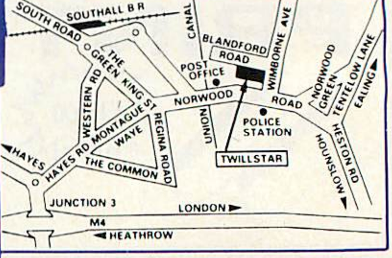


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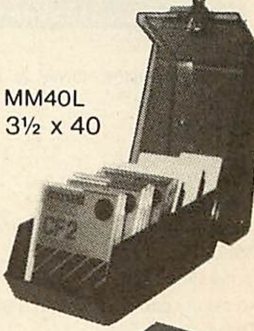
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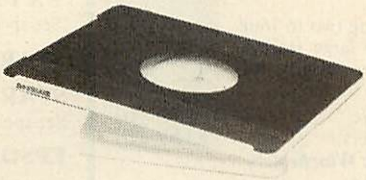
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Centronics lead to connect BBC to EPSON KAGA CANON etc

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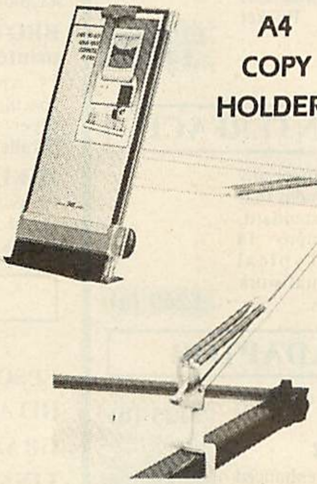
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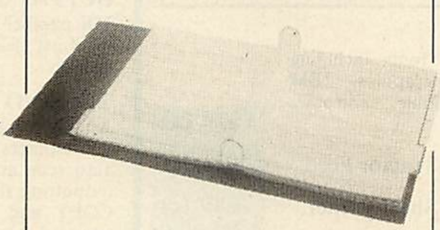
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Extension cable for external 5.25" Drive. £10 (d)

UPGRADE KITS

1.2 OS ROM	£15 (d)	1770 DFS Kit	£43.50 (d)
DNFS ROM	£17.50 (d)	Econet Kit	£55 (d)
BASIC II ROM	£22.50 (d)	64K Upgrade Kit for B+	£35 (d)
ADFS ROM	£26 (d)		

ECONET ACCESSORIES

Econet Starter Kit	£85 (b)	Econet Bridge	£174 (b)
Econet Socket Set	£29 (c)	Printer Server Rom	£41 (d)
File Server Level II	£120 (b)	10 Station Lead Set	£26 (d)
Ad Econet User Guide	£10 (d)	Econet Manager's Guide	£10 (d)

32016 CO PROCESSOR

For full specification see page 5 £1,099 (a)

CAMBRIDGE W/STATION

For full specification see page 5 £3,399 (a)

PANOS/PANDORA Upgrade incl 32000 BASIC FP. £29 (d)
Co-Processor upgrade to 8 MHz operation (to enable use of ADFS with floppy drives). £POA (d)

WINCHESTER DRIVES

Acorn 30 Mbyte Winchester with File Server Level III and ADFS hierarchical filing System. £1,599 (a)

P20HD TECHNOMATIC 20 Mbyte Winchester Drive fully compatible with Acorn ADFS and FS III. £645 (a)

P204HP TECHNOMATIC 20 Mbyte Winchester and a 80T DS floppy Drive built in a monitor stand. £840 (a)

P2041HT As P204HP but also with a 10 Mbyte tape streamer backup unit and backup utilities. £1,579 (a)

TS10 10 Mbyte Tape Streamer Backup unit with utilities. £695 (a)

TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10. £32 (d)

WINCHESTER Drive Multiplexer
A unique way of allowing two to four computers to share the large storage capacity of Winchester drives for saving and loading data.
TWM2 for two computers. £99 (b)
TWM4 for four Computers. £159 (b)

Details on Technomatic Winchesters and accessories on page 6

SECOND PROCESSORS

ACORN 6502 2nd Processor	£179 (b)
TORCH ZEP100	£229 (a)

MULTIFORM Z80
TECHNOMATICs multi format Z80 system includes a FREE Pocket Wordstar. £299 (b)
MS/DOS Read/Write Utility. £49 (d)
See page 7 for details.

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs. £269 (a)

TELETEXT ADAPTOR

Converts your computer into a teletext receiver. £125 (b)

TELETEXT ADAPTOR
BBC Publications rom for enhanced Teletext Utilities. £7.95 (d)

ROBOCOM BITSTICK

BITSTICK II	£775 (a)
Upgrade for Bitstick I to II	£415 (a)
Epson FX80 Dump for Bitstick I/II	£25 (d)

PRINTERS

EPSON LX86
120 cps, variety of fonts including NLQ, bit image graphics, IBM char/graphics compatible, centronics interface standard. £229 (a)

EPSON LX80/86 Tractor Feed £20 (c)

EPSON LX80/86 Sheet Feeder £49 (c)

EPSON FX85
160cps, 80 col, 8K buffer, NLQ, IBM compatible graphics Variety of fonts, multiple density bit image mode. £315 (a)

EPSON FX105
As FX85 but with wide carriage for 136 col £449 (a)

EPSON LQ800
See specification on page 5 £459 (a)

EPSON LQ1000
As LQ800 but wider carriage for 136 columns £659 (a)

TAXAN KP810
140 cps, 80 col, NLQ, 2K buffer, variety of fonts, quad density hi res bit image graphics, centronics interface standard £219 (a)

TAXAN KP910
As KP810 but with wide carriage for 156 col £389 (a)

NATIONAL PANASONIC KX P1080 £159 (a)
See specification on page 5.

STAR NL 10 (Parallel Interface) £239 (a)

STAR NL 10 (Serial Interface) £279 (a)
See specification on page 5.

EPSON JX80 colour printer £420 (a)

INTEGREX Multicolour Inkjet printer. £549 (a)
Ideally suited for high res colour VDU screen dumps. Quiteness & consistent output are major characteristics. £525 (a)
BBC Screen dump for Integrex. £15 (d)

CANON PJ1080A printer £409 (a)
4 Colours.

BROTHER HR15 Daisy wheel printer
14 cps, 3K buffer, proportional spacing, underline, bold, shadow print, super/sub script, two colour print, parallel interface. £299 (a)

JUKI 6100 Daisy wheel printer
15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface. £249 (a)

PLOTTERS

See details on page 5.

EPSON HI 80 PLOTTER	£325 (a)
HITACHI 672 PLOTTER	£464 (a)
GRAPHICS WORKSTATION	£609 (a)
LINEAR GRAPHICS	
A4 PLOTMATE	£224 (a)
A4M PLOTMATE	£299 (a)
A3M PLOTMATE	£426 (a)

PRINTER SHARERS & BUFFERS

BUFFALO 32K
32K parallel buffer for internal fitting to most EPSON/Epson compatible printers. £75 (c)

TECHNO SHARER BUFFER
A unique sharer/buffer connects upto 3 computers to a single printer with auto scan and switching to computer outputting the data. Printer PAUSE, COPY and CLEAR facility. Mains powered, two buffer sizes 64K & 256K

TSB 64 £199 (b)

TSB 256 £275 (b)

PERIPHERAL & COMPUTER SHARERS
High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases. all lines fully switched.

		Parallel		Serial
3 Computers to 1 Printer	36v36-3	£69 (c)	25v25-3	£65(c)
4 Computers to 1 Printer	36v36-4	£85 (c)	25v25-4	£75(c)
2 computers/2 Printers X-over	36v36-x	£69 (c)	25v25-x	£65(c)
BBC Cable set 3 to 1 (1m ea)		£32 (d)		£34(c)
BBC Cable set 4 to 1 (1m ea).		£39 (d)		£41(c)

BBC Computer Sharer: TCS26
1 computer to 2 printers fitted with BBC cable £22.00 (c)

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& Econet
Referral Centre

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Telex: 922800

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(b) £2.50
(c) £1.50
(d) £1.00

DISC DRIVES

Full details on page 6.

5.25" Single Drives 40/50 switchable:

TS400 400K/640K	£114 (b)
PS400 400K/640K with integral mains power supply	£129 (b)

5.25" Dual Drives 0/80 switchable:

TD800 800K/128OK	£226 (a)
PD800 800K/1280K with integral mains power supply	£245 (a)
PD800P 800K/1280K with integral mainspower supply and monitor stand	£263 (a)

3.5" 80T DS Drives:

TS351 single 400K/640K	£99 (b)
PS351 single 400K/640K with integral mains power supply	£119 (b)
TD352 Dual 800K/1280K	£170 (b)
PD352 Dual 800K/1280K with integral mains power supply	£187 (b)

DISC DRIVE MULTIPLEXER

Full specification on page 6.

TDM2 Dual Unit: 2 computers/one drive unit	£75 (b)
TDM4 Quad Unit: 4 computers/one drive unit	£135 (b)

3M FLOPPY DISCS

5.25" Discs in packs of 10

744 40T SS DD	£10.50 (d)
745 40T DS DD	£12.75 (d)
746 80T SS DD	£16.50 (d)
747 80T DS DD	£16.50 (d)

(Add £1 for library case packing)

3.5" Discs in packs of 10

80T SS DD	£20 (d)
80T DS DD	£27 (d)

BULK DISCS

High quality unlabelled discs supplied in packs of 50 in a storage box. The 5.25" discs have the reinforcing hub rings. These discs are guaranteed for life.

50 5.25" 40 T single sided discs in lockable box.	£35 (b)
50 5.25" 80T double sided discs in lockable box.	£45 (b)
50 3.5" 80T double sided discs in lockable box.	£95 (b)

FLOPPICLENE DRIVE HEAD CLEANING KIT

5.25" Kit with 20 disposable discs	£12.50 (d)
3.5" Kit with 20 disposable discs	£14.00 (d)

DISC STORAGE BOXES

DB530 Non Lockable 30 x 5.25"	£6.00 (c)
DB340 Lockable 40 x 3.5"	£8.50 (c)
DB550 Lockable 50 x 5.25"	£9.50 (c)
DB570 Lockable 70 x 5.25"	£11.00 (c)
DB5100 Lockable 100 x 5.25"	£13.00 (c)

MONITORS

BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors
Please specify plastic or metal case.

Microvitec 1431 Standard Resolution 453 pixels	£179 (a)
Microvitec 1431AP As 1431 + composite video and sound input	£195 (a)
Microvitec 1451 Medium Resolution 653 pixels	£225 (a)
Microvitec 1451AP As 1451 + composite video and sound input	£260 (a)
Microvitec 1441 High Resolution 895 pixels	£365 (a)

Microvitec 20" RGB/PAL/ Audio Monitors

Microvitec 2030CS Standard Resolution RGB/Comp Video	£380 (a)
Microvitec 2040CS High Resolution RGB/Comp Video	£685 (a)
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	£239 (b)
TAXAN SUPER VISION II 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	£279 (a)
TAXAN SUPER VISION III 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	£329 (a)
MITSUBISHI XC1404 14" Med Res RGB Monitor Etched dark screen brilliance and contrast control, BBC/IBM compatible	£229 (a)

12" MONOCHROME MONITORS

TAXAN KX1201G Hi Res green etched screen	£90 (a)
TAXAN KX1202G Hi Res Long Persistence (P39)	£98 (a)
TAXAN KX1203A Hi Res amber etched screen	£98 (a)
PHILIPS BM 7502 Hi Res green screen	£75 (a)
PHILIPS BM7522 Hi Res amber screen	£79 (a)
HANTAREX HX12	£69 (a)

MONITOR ACCESSORIES

Microvitec Swivel Base (14" plastic monitors)	£20 (c)
Philips Swivel Base	£14 (c)
Monitor Stand Models B & B+	£10 (c)
Monitor Stand Master	£13 (c)
Double Tier stand Models B, B+ or Master	£24 (b)
Taxan RGB Lead	£5 (d)
Microvitec Lead	£3.50 (d)
Monochrome BNC/Phono Lead	£3.50 (d)

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2 8K Rams	£37 (b)
ATPL Battery backup kit	£18 (b)
RAMROM 15 for Model B. External board in an attractive case — easy access to sockets. 6502 Processor signals for development work.	£79 (b)
Low Profile Cartridge Module Module + 1 cartridge	£12 (d)
Spare Cartridge	£2.50 (d)
Cartridge rack	£1.50 (d)
TIME WARP Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	£29 (d)

MODEMS

(All modems are BABT approved)
See page 7 for modem specifications

MIRACLE WS2000V21/23 & BELL stds	£102 (c)
WS2000 Auto Dial Card	£26 (d)
WS2000 Auto Answer Card	£26 (d)
WS2000 SK1 Kit	£5 (d)
WS2000 DS1 disc	£10 (d)
WS2000 Data Cable for BBC	£6 (d)
MIRACLE WS4000 V21/23	£149 (b)
MIRACLE WS3000 V21/23	£295 (b)
MIRACLE WS3000 V22	£495 (b)
MIRACLE WS3000 V22 bis	£650 (b)
WS3022 1200/1200 fd NEW	£395 (b)
WS3024 2400/2400 fd	£570 (b)
BBC Data Cable for WS3000	£7 (d)
GEC DATACHAT Modem V23 1200/75, 75/1200 & 1200/1200 pseudo f.d. line powered, complete with software suitable for connecting to Prestel, Micronet, Telecom Gold and many bbs. **Special offer price**	£39 (b)

PROGRAMMING ACCESSORIES/SOFTWARE

See page 8 for detailed specification
Compatible with B, B+ and Master

EPROMER II with disc based software and rom image	£99 (b)
META ASSEMBLER	£145 (b)
PORTAL EPROM EMULATOR 256K	£185 (b)
PORTAL EPROM EMULATOR 512K	£285 (b)
TEAM Disassembler	£145 (b)

EPROM ERASERS

UV1B 6 eproms, safety cutout	£47 (b)
UV1T 6 eproms, timer, safety cutout	£59 (b)

CAD/DRAWING PACKAGES

NOVACAD CAD Package for B, B+ & MASTER (See page 9 for specification)

LEADING SUPPLIER TO THE BBC MARKET
ESTABLISHED OVER 15 YEARS

TECHNOMATIC

17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

BASIC Version	£79 (d)
Tracker Ball/Mouse Version (TM)	£99 (d)
TM Version plus Tracker Ball	£129 (c)
TM Version plus Mouse	£115 (c)
Plotter Driver Generator	£28 (d)
MOUSE	
AMX MOUSE with SUPER ART (pse specify B, B+ or Master)	£67 (d)
Super Art	£43 (d)
PAGEMAKER	£43 (d)
3D ZICON	£21 (d)
PAINTPOT	£21 (d)
DATABASE	£21 (d)
RB2 TRACKER BALL	
RB2 Tracker Ball with Icon Master (for B, B+ & Master)	£59 (c)
RB2 Tracker Ball with Cursor Control Rom (for Master only)	£59 (c)
RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software)	£47 (c)
Cursor Control Rom for Master	£12.50 (d)
MIRRORSOFT FLEET STREET EDITOR incl VAT	£39.50 (d)

SOFTWARE CP/M SOFTWARE

for Acorn, Torch & Multiform Z80 Processors

MICROPRO's Wordstar Professional	£310 (a)
ASHTON TATE's DBASE II	£310 (a)
SUPERCALC II	£195 (a)

Send for details on our full range of CP/M & PC DOS packages for Business, Communications & High Level Languages.

BBC SOFTWARE/ FIRMWARE

DATABASE MANAGEMENT SYSTEMS

VIEWSTORE Acorn's database with display in any mode in spreadsheet or user defined card format and powerful sort facilities. Max file size 4Mb	£37 (d)
STARdataBASE A fast machine code, true random access database. Upto 4000 records/file, 69 fields. Fully menu driven, user defined record layout, very fast searches thru keysearch facility. Mailmerging from VIEW and WW.	£49 (d)
MASTERFILE II Highly popular economically priced database. 17 fields per record, file size limited by drive capacity only. (40T or 80T)	£17 (d)

WORD PROCESSORS

VIEW 2.1	£37 (d)
VIEW 3.0 New version of VIEW compatible with B+ complete with a printer driver generator.	£56 (c)
Hi-VIEW Disc based version of VIEW 2.1 for use with 6502 2nd processor allowing upto 47K of memory for text.	£36 (d)
VIEWSPELL Acorn's new rom based spelling checking utility with a 70,000 word dictionary on 80T disc. Additional/specialised dictionaries can be created. Facilities also include wild card search for words.	£29 (d)
VIEW INDEX	£12 (d)
VIEW PRINTER DRIVER GENERATOR A utility to generate a View printer driver to suit any printer. Screen driver allows viewing of text exactly as it will appear on paper.	£9 (d)
DOT PRINT PLUS Full details on page 5 NLQ rom for Epson FX/RX, MX and GLP.	£28 (d)
WORDWISE	£24 (d)
WORDWISE PLUS	£38 (d)
INTERWORD (If you own a WW+ then quote your reg number and pay £10 less).	£49 (d)
WORDEASE A 16K rom based utility for WW+	£24 (d)
SPELLCHECK III A 16K rom based spellcheck program for View and WW. Contains 2000 words on the rom and 6000 (expandable to 17000) words on a disc.	£31 (d)
EDWORD II	£43 (c)

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 cols and 255 rows and will operate in any mode. Fully compatible with VIEW and 6502 2nd processor.	£37 (d)
VIEWPLOT A disc based plotting program. (To be released soon).	£22 (d)
INTERSHEET The new spreadsheet from Computer Concepts with many advanced features like 105 col mode, holding several spreadsheets in memory at a time etc.	£39 (d)
INTERCHART Graphics package for Intersheet	£27 (d)
ULTRACALC BBC Publications very popular and well proven spreadsheet rom includes graphics utility disc.	£52 (d)
QUICKCALC A disc based economically priced spreadsheet package (40 or 80T Disc).	£14.50(d)
MINI OFFICE II A suite of inexpensive but extensive word processor, database and spreadsheet packages. (40T or 80T)	£14.75(d)

LANGUAGES

META ASSEMBLER Multi processor Assembler full details on page 8	£145 (c)
TEAM DISASSEMBLER	£145 (b)
ACORN 6502 DEV. PACKAGE A macro assembler with utilities for developing large programs in assy lang. Requires 6502 2nd processor.	£43 (d)
MACROM A very fast full featured macro assembler rom from 6502 and 65C02 codes, allows use of macros from library disc. Assembly can be disc to memory, memory to memory, memory to disc and disc to disc thus allowing very long source code upto the length of disc in use. About 3 times as fast as ADE and 30% more economical in memory.	£33 (d)
ACORN MICRO PROLOG Logic programming language used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more friendly.	£62 (d)
ISO-PASCAL Acorn's full implementation of International Std Pascal on 2x16K roms.	£48 (c)
ISO PASCAL STAND ALONE GENERATOR	£30 (d)
OXFORD PASCAL A fast P-code compiler and stand alone utility (40 or 80T).	£36 (d)
BCPL	£46 (c)
BCPL CALCULATIONS Supports floating point, fixed point and fast integer calculations on BCPL	£17.50 (d)
BCPL STAND ALONE GENERATOR	£39 (d)
ACORN LOGO	£46 (c)
LOGOTRON LOGO	£55 (c)
BBC PUBLICATIONS OPEN LOGO	£59 (c)
ACORN LISP ROM	£39 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£43 (d)
MICROTEXT A frame based authoring system from NPL for interactive computer tutoring. Disc based	£52 (c)
MICROTEXT PLUS Extended Features incl extra memory, control of external devices etc. Rom based.	£229 (b)

COMMUNICATIONS

TERMULATOR Advanced terminal emulator which includes VT52/100, Tektronics 4010, teletype emulations.	£25 (d)
COMMSTAR A highly popular communication rom suitable for all general purpose applications (specify B or Master)	£28 (d)
COMMUNICATOR A full 80 col VT100 emulation program with easy to follow screen menus.	£49 (d)
DATABEEB A variety of facilities for use with WS2000 Modem	£26 (d)
DS1 DISC Special utilities for use with WS2000	£10 (d)

UTILITIES

ACCELERATOR	£49 (d)
ACORN BASIC EDITOR	£22 (d)
MONITOR (BBC Pub)	£34 (a)
BROM PLUS	£26.50 (d
SLEUTH	£23 (d)
TOOLKIT PLUS	£31 (d)
TOOLBOX 2 (BBC Pub) Manual	£9.50 (d)
Cassette	£9 (d)
EXMON II	£23 (d)
HELP II	£25 (d)
ACORN GXR GRAPHICS ROM specify B or B+	£22 (d)
PRINTMASTER	£24 (d)
DUMPMASTER supports about 40 printers	£26 (d)
FONTWISE PLUS	£17 (d)
HERSHEY FONT CHARACTER GENERATOR	£18 (d)
ICON MASTER	£29 (d)
BILLBOARD	£18 (d)
STUDIO EIGHT	£19 (d)
MOVIE MAKER Two Roms + Cassette	£26 (d)
CC SPEECH ROM	£28 (d)
CC SPEECH ROM to Text Rom	£34 (d)
ACORN SPEECH ROM	£15 (d)
ADV TELETEXT UTILITIES ROM	£7.95 (d)

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BBC PUBLICATIONS EDUCATIONAL SOFTWARE

A series of programs developed in many cases alongside Radio & TV programmes by BBC's Education Department which supplement the classroom studies by moving and colourful displays helping in clear understanding of a variety of subjects. Some packages also include audio cassettes.

PRIMARY EDUCATION

ASTRONOMY:
9-12 years. Phases of moon, eclipses, seasons etc. Includes a game. Disc **£11 (d)**

COMPUTERS AT WORK:
The Work Game illustrates two of the most important computer applications: Robotics & IT. Incl. a database prog, word processing tutorial and a robotic control prog. Aud/EC/disc **£16 (c)**

PICTURE CRAFT
An inexhaustible, versatile and flexible suite of programs to design shapes & patterns, paint them and convert them into pictures, puzzles and games. Disc **£17 (d)**

DRAWSTICK
8 year upwards for creating pictures, charts, maps etc. Pictures created can be used in your own programs. Sufficiently sophisticated for use by adults. Cass **£8 (d)**

INTRODUCING GEOGRAPHY
9-13 years. Four exciting graphical adventures include river navigation, flying, mountain climbing and desert crossing. Disc **£16 (d)**

MATHS WITH A STORY 1
Four primary level programs incl symmetry, co-ordinates and probability for children of wide ranging abilities. Cass **£8 (d)**

MATHS WITH A STORY 2
Similar programs as 1 but covered from a different angle. Cass **£8 (d)**

NUMBER GAMES:
6 programs designed to stimulate the mind of an active child of 8 years and upward. Cass/EC **£7.50(d)**

USING YOUR COMPUTER
8/12 years. Introduction to computers using synchronised audio techniques. Total of 80mins of audio & 14 progs. Cass **£24 (c)**

WORD PLAY
An elegant but simple introduction to word processing using animal shapes for editing functions. Fun manual for the children. Cass **£10 (d)**

WORD MOVER
A simple text editor. Cass **£8 (d)**

SECONDARY LEARNING

ADVANCED LEVEL STUDIES: STATISTICS
6 progs covering central concepts and principles. Topics include Discrete Data & Binomial Distribution. Eont. Data & Normal Data Distribution. Hypothesis Testing & Confidence intervals, Central Limit theorem & Estimation, Simulations, Correlations and Regressions. Disc **£23 (d)**

ADVANCED STUDIES: GEOGRAPHY
4 progs covering social geography: Traffic & Town planning, drainage & basin management and planning for industry. Cass **£10 (d)**

INSIDE INFORMATION
Designed to introduce IT to young adults. Suitable for use in sec. schools, ITeCs & Adult Educ. Centres. Prog Cass **£10 (d)** Audio Cass **£5 (d)** Book **£8 (d)**

OPEN LOGO
Open University Logo incl two 16K roms and two manuals. **£55 (c)**

SCIENCE TOPICS (ST)

S.T.: WAVES
A Physics program allows display of waveforms and shows changes caused by different parameters. Disc **£14 (d)**

S.T.: RELATIONSHIPS
A Biology program giving a sophisticated simulation exercise based on data from W.H.O. Disc **£14 (d)**

S.T.: BONDING
A Chemistry program to reinforce & strengthen the concept of bonding of elements. Transfer and sharing of electrons are both shown graphically. Disc **£14 (d)**

S.T.: ELECTROMAGNETIC SPECTRUM
A graphical adventure prog to test your knowledge of the electromagnetic spectrum. Disc **£14 (d)**

S.T.: ELECTRONICS IN ACTION
Program about using computers for control. Control is achieved by using 6502 assy lang. Prog editor is supplied. Disc **£14 (d)**

S.T.: NEWTON & THE SHUTTLE
A interactive prog in 3 parts covering launch to recapture of a satellite to test the knowledge of Newtonian mech. Disc **£19 (d)**

S.T.: ECOLOGY
Simulation program managing a nature reserve to meet a host of individual needs. Disc/EC **£19 (d)**

S.T.: POLYMERS
Students run a manufacturing co. and have to choose best materials for their products and compete with a rival co. run by the computer. Disc/EC **£19 (d)**

S.T.: CLASSIFICATION & PERIODIC TABLE
A database program for producing different classifications of chemical information and presented in any format. Disc **£20 (d)**

S.T.: FOOD & POPULATION
Simulation in space of biological aspects of nutrition and food production logistics. Disc **£20 (d)**

SEC. SCIENCE: MICROTECHNOLOGY
Fundamental concepts of electronics Logic & Resistor Tutors, Servo Cct simulation & a cct design program. Cass **£7 (d)**

SEC. SCIENCE: THE MOLE CONCEPT
A computer sync. audio program explains definitions of atomic & molecular masses and depicts molar equations. Disc/Aud/EC **£16 (c)**

SEC. SC.: UNIFORMLY ACCELERATED MOTION:
Illustrates basic eqns., uniform accln, under gravity and an idea of terminal velocity. Disc/AUD/EC **£16 (d)**

VU-TYPE
The popular 'Sight & Sound' touch typing tutor with alterable settings. Disc/EC **£15 (d)**

GENERAL

GAME CORE
Provides information and intelligence routines for writing board games. Cass **£9 (d)**

VU TYPE PROFESSIONAL
An enhanced and expanded version of Vu Type with 63 Pitman approved exercise. Disc **£19 (d)**

WHITE KNIGHT MK II
(Specify if for Master). Disc **£16 (d)**

BATTLEFIELDS Cass **£8.50 (d)**

DEUTSCH DIREKT
Disc based vocabulary learning prog with audio cassette to help with pronounciation. Disc/aud/EC **£16 (c)** Book **£5.95 (d)**

A VOUS LA FRANCE
A home study aid for anyone learning French. Cass/EC **£12 (d)** Book **£5.25 (d)**

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

PRINTER ACCESSORIES

EPSON ACCESSORIES:

Interfaces:
8143 RS232 .... £28 (d)
8148 + RS232 + 8K .... £75 (d)
8165 IEEE + Cable .... £65 (d)
8148 RS232 + 2K .... £57 (d)
8132 Apple II .... £60 (d)
8177P NLQ for FX80 + /FX100 + ... £99 (d)

Parallel & Serial Buffers of various size also available.

FX80/80 + /85 Tractor Attachment .... £37 (c)
FX80/80 + Paper Roll Holder .... £17 (c)
LX80 Tractor Feed .... £20 (c)
LQ800 Tractor Feed .... £44 (b)

SHEET FEEDERS:
8338 LX80 .... £49 (b)
8333 FX100 + /105 .... £169 (a)
8331 FX80 + /85 .... £129 (b)
8330 RX80 + ... £129 (b)
LQ800 .... £129 (d)

Ribbons:
RX/FX100/100 +. FX105 .... £10 (d)
RX/FX80/80 +, FX85 .... £5 (d)
LX80 .... £4.50 (d)
LQ800 .... £10 (d)
H180 Pen Set (Aqueous/Ball point) .... £7.50 (d)

Dust Covers:
FX80 .... £5.50 (d)
TAXAN/Canon KP810 .... £6 (d)
FX100 .... £7.50 (d) **KP910** .... £7 (d)

HITACHI 672 Plotter
Aqueous Pen Set six pens .... £18.50 (d)
Oil Based Pen Set six pens .... £25.00 (d)

TAXAN CANON Accessories:
RS232 + 2K buffer .... £78 (d)
Ribbon .... £6 (d)

JUKI 6100
RS232 Interfaces .... £65 (d)
Tractor Feed .... £129 (a)
Ribbon (Carbon) .... £2.00 (d)
Spare Daisy Wheel .... £14 (d)
Sheet Feeder .... £182 (a)

BROTHER HR15
Daisy Wheel .... £18 (d)
Tractor Feed .... £90 (a)
Ribbon (Carbon/Nylon) .... £3.00 (d)
Sheet Feeder .... £182 (d)
Keyboard .... £135 (a)

Printer Leads:
BBC Parallel Lead (1.2m) .... £10 (d)
BBC Serial Lead (1.2m) .... £6 (d)

Other lengths can be supplied on order:
IBM Parallel Lead (2m) .... £12 (d)

PAPER & LABELS

Plain Fanfold paper with micro perforations:
2000 sheets 9½" × 11" .... £13 (b)
2000 sheets 14½" × 11" £18.50 (£4.50)

Labels/1000:
Single Row 3½ × 1 7/16" .... £5.25 (d)
Triple Row 27/16" × 17/16" .... £5 (d)

BBC SPARE PARTS

All Prices are Retail ex-VAT carriage code (d).

BBC & Misc:		74ALS 245	£5	74LS10	£0.24
Keyboards	£52 (b)	88LS120	£3.00	74LS123	£0.80
Powers Supply	£52 (b)	**BBC PLUS:**		74LS163	£0.75
Keyswitch	£1.75	PAL16REN	£13.50	74LS244	£0.80
Video ULA	£18	64K × 4 DRAM	£8.50	74LS245	£1.10
Serial ULA	£14	6512A	£12.50	74LS373	£0.90
DNFS	£18	SAA5050	£9.00	74LS393	£1.00
UHF MOD	£4.50	6845SP	£6.50		
6502A CPU	£6.50	UPD7002	£5.00	**BBC MASTER:**	
65CO2 CPU	£12	DS3691	£3.50	1-Mbit ROM	£39
6522 VIA	£3.50	7438	£0.40	MSI CHROMA	
6522A VIA	£5.50	74LSOO	£0.24	IC	£13.50
LM324	£0.45	74LSO4	£0.24	65SC12P-2	£12.50

TECHNOMATIC

LEADING SUPPLIER TO THE BBC MARKET
ESTABLISHED OVER 15 YEARS

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ACW443 CAMBRIDGE WORKSTATION

A complete self-contained workstation with:.

* NS32016 8MHz Main Processor & 32081 FP processor.
* 20 Mbyte Winchester and one 80T Ds floppy drive.
* A detachable keyboard Hi Res RGB Monitor.
* 4Mbyte of on board Ram as standard.
* Languages supplied include: Fortran 77, Pascal, C, Cambridge LISP, 32016 Assembler & 32bit BASIC.
* Utilities on the operating system to cross link programs between different languages, utilities for porting programs to mainframes.
* **Phone for detailed leaflet.**

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to the BBC Computer.

* Interfaces with the BBC through the tube connector.
* NS32016 6MHz CPU & 32081 FP processor.
* 1Mbyte Ram as standard.
* Packaged software includes all the languages and utilities supplied with the ACW Work Station.
* **Phone for detailed leaflet.**

CPU/FP Upgrade Kit (non-Acorn) for the Co Processor for 8Mhz operation to enable use of ADFS with the floppy drives is available. It can be fitted at no extra charge if ordered with the Co Processor.

A list of software available for the 32 bit processors is available on request.

512 CO-PROCESSOR

Brings professional software to the BBC Master.

* 10 Mhz 80186 *DOS PLUS.
* GEM Write & GEM Draw.
* 'WIMP' Environment with high quality Mouse.
* Runs many 'IBM' programs — even 'Flight Simulator'!
* Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

* Built-in character font generator.
* Built-in view printer driver.
* Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
* True bold print as well as double width.
* 12 character pitch as standard.
* Fully variable pitch and line spacing.
* Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
* **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
* **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

Notice how MICROJUSTIFICATION eliminates 'stretched' spaces between words.



For price details see page 1.

Compact

BRITISH BROADCASTING CORPORATION
MASTER SERIES MICROCOMPUTER

THE FAMILY COMPUTER

Now available from stock

This low cost high tech computer has developed specially as a computer for home use.

SPECIFICATION

128K RAM, ADFS Filing system, BBC Basic version 4, MASTER style keyboard, a single 640K 3.5" double sided drive. RGB/Mono Monitor as an optional extra.

Bundled software pack includes:
Desk Top Prog with note pad & calculator, VIEW 3.0, Card Index, & LOGOTRON. A set of exciting games and graphic demos.

EPSON LQ800/1000

Uses top quality 24 pin dot-matrix technology.

* Superb 'letter quality' at 67cps.
* Fast clear draft quality at 200cps.
* LQ/Draft modes selectable from front panel.
* Variety of fonts, usable in both draft & LQ modes.
* Optional 'personality' modules for Diablo and IBM emulation.
* Optional Font modules.
* Friction feed.
* Hi Res bit image graphics with hex density.
* 7K buffer, both serial and parallel interfaces as standard.

EPSON HI-80

* A4 with 4 colour precision plotting.
* Low cost while maintaining precision.
* Variety of pens available.
* Ideal for overhead transparencies.
* Powerful software commands allow complex plots.
* Superb line/bar/pie charts simply produced.

STAR NL10

A 80 col 120 cps printer with fine NLQ at 30 cps offers novel and innovative features. There are no dip switches to set, full control from the front console. Plug in interface cartridge simplifies adaptation to different computers. Friction & Tractor feed as standards. Epson Compatible Graphics.

NATIONAL PANASONIC KX P1080

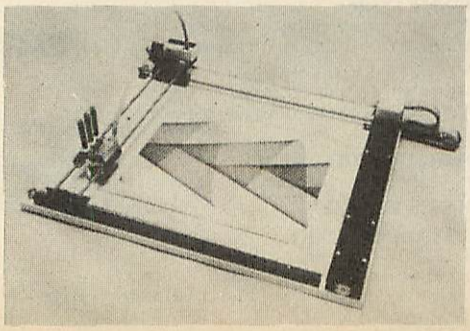
A high performance low cost printer with full character pitch feature 10, 12, 15 & 17 cpi and proportional spacing in both draft and NLQ mode. 80 column, 100 cps draft and 20 cps in NLQ. Parallel interface and Friction and Tractor feeds as standard. Epson Compatible Graphics.

HITACHI 672

* A3 four colour precision plotter.
* Serial and parallel ports as standard.
* Produces 'OHP' transparencies as well as plain paper.
* 'HP' graphics language or single character commands.

GRAPHICS WORKSTATION

A A3 pen plotter with 0.1mm resolution allows graphs, charts, architectural drawings to be plotted using the 9 predefined plotting instructions or by using a CAD package. The pen mount allows a variety of pen types including drawing pens to be used or the following range of accessories to be fitted.



OPTICAL SENSOR

This converts the plotter into a input device and offers a new range of applications: Scan or digitise a picture or a drawing to display or store. Traverse mazes and investigate methods of artificial intelligence. Reliably read bar codes.

DRILL/ROUTER

This will drill holes, machine moulds and cut complex 3-D shapes in a range of suitable materials to a depth of 16mm. Driver software is supplied on disc and an optional application program is available to interface the drill/router to our NOVACAD package.

SCRIBER

The sharp pointed scriber may be used to etch fine line drawings on surfaces such as scraperboard, wax coated copper etc. Full details on request. See page 1 for price.

All accessories available separately if required.

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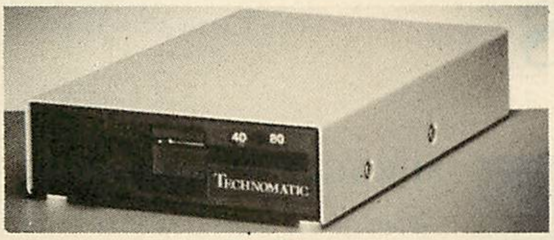
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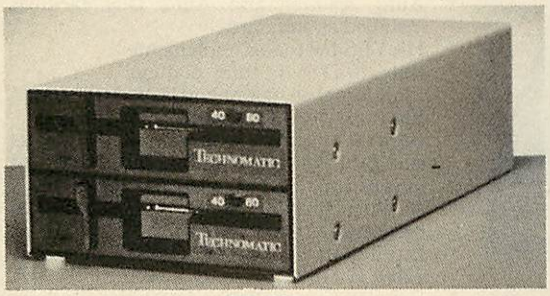
Orders welcome from
government depts &
educational establishments.

All prices ex VAT.
Prices are subject
to change without notice.

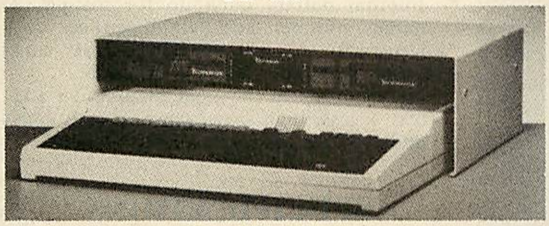
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(c) £1.50
(d) £1.00



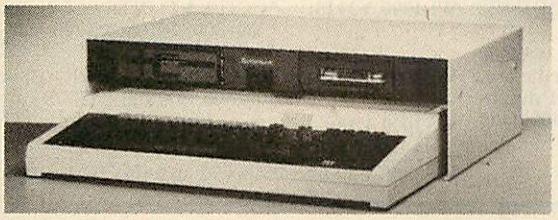
TS 400



PD 800



PD 800 P



P2041 HT

DISC DRIVES

TECHNOMATIC offers a wide range of high quality, high performance drives to meet all needs of BBC micro users. Please see our detailed and competitive price list on page 2.

*All drives are fitted with high quality slim line ultra low power mechanisms capable of single and double density operation and offering very fast track access and head settling times.

*5.25″ floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

WINCHESTER DRIVES

Mass storage 20 Mbyte drives are available in the following versions:

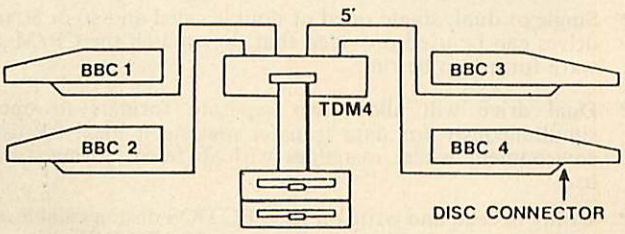
* P20HD Stand alone.
* P204HP With a single floppy housed in a plinth version case.
* P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.
* TS10 A stand alone 10Mbyte streamer for those who are already equipped with a Winchester and a floppy drive. Utilities for backup can only be loaded from a floppy.

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

ALL TECHNOMATIC DRIVES CARRY A TWO YEAR WARRANTY AS STANDARD
(Effective 01.08.86)

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5′ of cable per outlet as standard. Mains powered.



TDM4 Quad Unit (up to 4 computers)
TDM2 Dual Unit (2 computers)

WINCHESTER DRIVE MULTIPLEXER

A unique addition to our hardware range that allows the sharing of a Winchester between a number of computers. The principle of operation is the same as our highly popular disc drive multiplexers and there is no need for any additional software or hardware modifications. The Multiplexers are available in two versions, a dual unit for two computers and a quad unit for four computers to share a Winchester. Multiplexers are particularly useful for accessing common software and transferring data between the computers. (Not recommended for use with randon access files).

FLOPPICLENE

Disc Drive Cleaning Kit

Floppiclene introduces a positive concept in ensuring continuous high performance of the disc drives by providing an easy and efficient method of keeping the drive heads clean. Use of disposable cleaning discs eliminates the risk always present in reuseable discs of recontamination and abrasion of the sensitive drive heads. Available for both 5.25″ and 3.5″ drives. Please see page 2 for prices.

3M FLOPPY DISCS

3M are the worlds largest producer of magnetic media and are acknowledged as leaders in magnetic media technology. Every single 3M Floppy Disc carries a written lifetime guarantee that it will perform reliably. Not only do 3M offer a highest quality product but also a very competitive price. Please see page 2 for details. 3M Floppy Discs are supplied in sturdy storage boxes each containing 10 discs.

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MODEMS

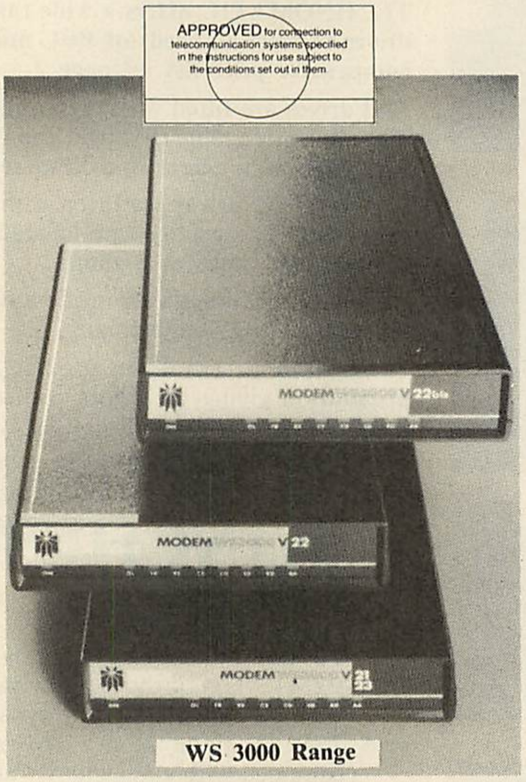
MIRACLE WS4000

* A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
* Plain English commands make it simple to use, even for the first time user.
* Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
* Equalisation model in V23 for line-noise filtering.
* Many other options including upgrading to V22 and V22 bis.

MIRACLE WS2000

* A comprehensive manually switched 'World Standard' modem.
* Competitively price with a capability to be upgraded for various options.
* BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
* Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).
* SK1 chip set for computer control.
* User port cable.
* Auto dial Board.
* Auto Answer Board.
* DS1 disc for auto dial facilities on Commstar.



WS 3000 Range

Miracle have introduced two new models in the WS3000 series for users who require a modem for a specific use. Model WS3022 provides 1200/1200 baud full duplex operation whilst only WS3024 provides 2400/2400 baud fd only.

Please see page 2 for prices

MIRACLE WS3000 RANGE

* A professional range of intelligent modems with full BABT approval.
* Auto Answer and Auto Dial facilities installed as standard.
* HAYES protocols implemented.
* Pulse or DTMF 'tone' dialing.
* Plain English command structure simplifies the use of the modem.
* Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
* A line sharing facility to differential between data and voice calls.
* Intelligent speed buffering converts 1200/1200 terminals to 1200/75
* Equalisation mode for line noise filtering.
* Internal battery back up for storing 63 names, numbers and default settings.
* Upgrade path for 1200/1200 and 2400/2400 and security encryption.
* Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400.

MULTIFORM Z80

includes a FREE Pocket Wordstar package

A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.

" A wide selection of programs were installed and tested without problems. The task of transfering and installing the programs for the system was greatly eased by the flexibility of the multiformat approach and the implementation of the terminal emulators. *Ed Brown Acorn User Oct 86.* "



Please see page 1 for prices

* It is capable of running most CP/M 2.2 format applications programs on the BBC.
* Connects to the BBC via 1MHz bus, no restriction on the cable length. OS/M operating system on rom.
* Integral mains psu and 64K on board ram.
* 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
* Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
* Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M .
* Multiform is fully compatible with Acorn's 8271 and 1770 DFS on models B, B plus and the Master.
* Single density dfs allows single density CP/M format use. Double density dfs allows both single and double density CP/M formats to be used.
* Single or dual, single sided or double sided and 40 or 80 track drives can be used provided that they match the CP/M software format to be run.
* Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
* Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
* Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

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Prices are subject to change without notice.

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(c) £1.50
(d) £1.00



Epromer is supplied with a integral mains psu, all the necessary cables, a manual and software on disc. Disc also contains the rom image for use with sideways ram. Rom based software is available as an optional extra if required.
Epromer is fully compatible with Acorn DFS on the BBC B, B+ and the MASTER. Please see page 2 for price.

EPROMER II

Eprom Programmer for the BBC Micro Series

* A sophisticated Eprom Programmer that uses the latest Eprom Programming technology to simplify the use of the programmer and at the same time allowing the programmer the full control of the programming process.
* It handles the full range of popular single rail Eproms up to 27256.
* Powerful menu driven software makes the programming of eproms simple and efficient.
* Selectable programming voltage 25/21/12.5V.
* Two programming option, standard and algorithmic for eproms capable of high speed programming. 27128 can be programmed in just over 2 mins.
* Single address to full eprom address selectable for any of the epromer function ie blank check/read/burn/verify.
* Full screen editor with input in hex or ASCII.
* Software interface for special programming requirements eg programming alternate bytes etc.
* Many other useful utilities included.

Please send for full specification sheet.

META Version III

The only package in the micro market that will assemble such a list of processors and cost so little.

All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach.

Acorn User October 1986

META Ver. III is supplied on two 16K roms and two discs with total code in excess of 70K. An A4 size 55 page manual written in easy to follow style makes the operation of Meta simple to follow. Meta supports over 40 different processor families including the 16bit 68000. Appropriate standard mnemonics are used for each type of processor.

Major features are:

* Fully nestable macro facilities, nestable conditional entry (IF/ELSE/ENDIF).
* Modular Source Code (including parameter passing).
* Local & global labels are to 32 bits and can have upto 31 chars.
* A complete set of arithmetic instructions to 32 bit precision.
* Object code may be sent in 30 different ways DURING ASSEMBLY to disc files, RS232 port or emulators. All popular formats are included.
* A full array of Directives (over 50) incl DS.X, DC.X, EQUX, FCB etc.

Built-in Editor with all the features of a good wordprocessor like search, search/replace, delete/copy blocks, loading text at cursor etc are included, coloured highlighting distinguishes between assembler statements, comments and current cursor line.
A special Serial Communicator area with its own options page.

TEAM DISASSEMBLER

Part of the META/PORTAL family now available from stock.

Please send for our detailed leaflets on the above products.

PORTAL EPROM EMULATOR

* Portal eprom Emulator directly emulates all 27xxx (NMOS & CMOS) eproms in real time with 150 nS access time on any target system.
* Transferring of code into PORTAL is handled by META at the rate of 4Kb/s.
* All PORTAL operations are controlled by META Directives.
* PORTAL allows the code to be updated/altered within seconds and eliminates the time required for programming and erasing eproms.
* Various options are available for sending code ie use of two portals for 16 bit data bus with sequential PORTAL skipping.
* Upto 4 PORTALS can be connected to the same BBC lead.
* Each PORTAL has a lead terminating into a 28 pin dil header for plugging into target systems eprom socket.

PORTAL 128 will emulate 2716, 2732, 2764 and 27128.
PORTAL 512 for all eproms listed above + 27256 & 27512.

BOOKS

No VAT
Carriage Code (c)

LANGUAGES
6502 Assy Lang Prog............£19.95
6502 Programming..............£13.95
8086 Book.......................£23.95
Acorn BCPL User Guide........£15.00
Acorn FORTH.....................£7.50
Acorn LISP.......................£7.50
Acorn ISO Pascal Ref Manual.£10.00
Intro to COMAL..................£10.00
Intro to LOGO....................£7.50
Micro Prolog Ref Manual.......£10.00
Introduction to Turbo Pascal..£14.95
Prog the Micro with Pascal.......£8.50
The UNIX Book..................£7.50
Unix User Guide................£19.95
Understanding Unix.............£18.45

BBC MICRO GUIDE BOOKS
BBC User Guide Acorn..........£15.00
BBC Plus User Guide...........£15.00
Drawing your Own BBC Programs...........................£6.95
Inside Information................£8.95
Math Prog in BBC Basic..........£7.95
Toolbox 2.........................£10.95
VIA 6522 Book....................£4.50

PROGRAMMING/UTILITY
Advanced Sidewise Ram User Guide £9.95
Advanced User Guide (BBC)...£15.95
Advanced User Guide...........£12.50
Applied Ass./Lang on the BBC.£9.95
BBC Micro Sideways ROM's RAM's £9.95
Guide to the BBC ROM..........£9.95

Beginners Guide to W.P.........£7.95
View 3.0 User Guide.............£10.00
Viewstore.........................£10.00
Viewsheet.........................£10.00
Wordwise Plus.....................£9.95

SOUND & GRAPHICS:
Mastering Music...................£6.95

DISC DRIVE SYSTEMS:
Advanced Disc User Guide.....£16.95
Disc Book..........................£3.50
Disc Programming Techniques..£7.95
Disc Systems.......................£6.95
File Handling on the BBC........£6.95
Discovering Disc Drives..........£POA

APPLICATIONS:
Interfacing Proj for BBC.........£6.95
BBC and Small Business.........£5.75

PROFESSIONAL SOFTWARE
Wordstar made easy.............£16.95
Introduction to Wordstar.......£17.95
Wordstar Handbook............£11.95
dBase-II for the first time user.£16.95
Understanding dBase-III........£22.95
Multiplan Made Easy............£18.95
Multimate Complete Guide.....£16.95
ABC of LOTUS 123.............£17.45
1-2-3 for Business................£16.95
Adv Tech in dBase II/III........£22.95
Mastering CP/M..................£17.95
CP/M Bible........................£16.50
Introducing CP/M on BBC & Z80..............................£9.95
MS/PC DOS Prompt...........£10.95

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NOVACAD

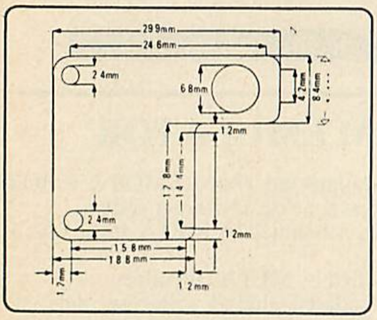
Computer Aided Draughting for the BBC Micro

"The Novacad system is a thoughtfully designed piece of software requiring a minimum of manual bashing so that real results are possible with just a few hours work."

"Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market"." **A&B Computing August 1986**

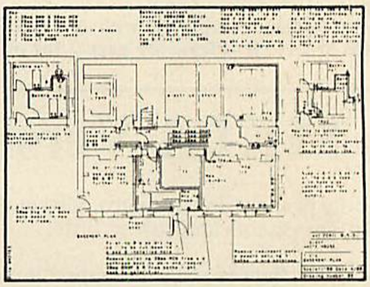
A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

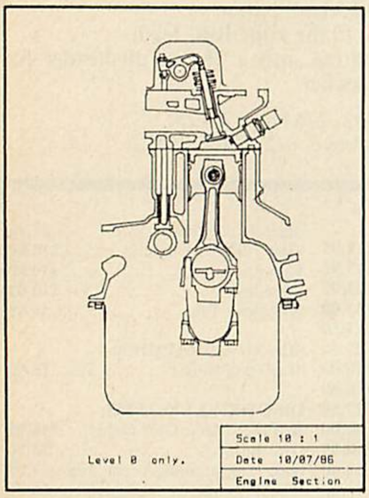
NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

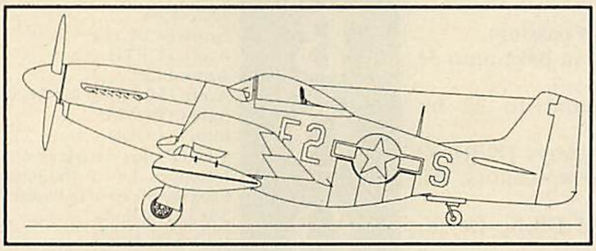


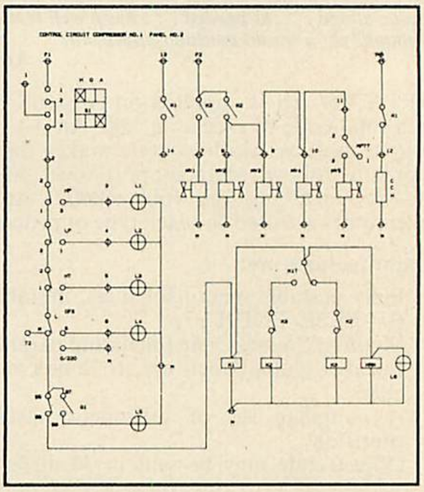
The major features of NOVACAD are:

* Simple and easy to use with logical command sequence.
* A large drawing area (approx 15 screens).
* The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
* A zoom facility allowing magnification of up to 20 times to insert finer details.
* Block copy of shapes on the screen for repetitive use.
* Text entry at any 90° orientation at any position on the screen.
* Create multi layer drawing with 8 levels available.
* Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
* Printer routine for Epson 80 and 136 column printers.
* A unique facility to output to any BBC compatible plotter.









MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours with shadow memory, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will have additional user memory for more complex drawings.
6502 second processor will also increase the drawing speed.

NOVACAD is available in two versions

*BASIC version for cursor control from the keyboard.

*T/M version for cursor control from the keyboard, Tracker Ball or a Mouse.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

ROUTCAD, an optional software package for our Graphics Workstation allows for production of shapes drawn using NOVACAD in 3D on suitable material and is ideal for a range of applications including template making and model building.

NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.

LETTERS

Write to Letters, Acorn User, 141-143 Drury Lane, London WC2B 5TF

DON'T FORGET THE OLDIES

Sir, I endorse heartily the letter from Brian Battersby in your September issue, concerning the pre-knowledge assumed by articles and manual authors. There must be many hundreds of your readers who, like myself, purchased a BBC machine together with the User Guide and then set about learning Basic, aided perhaps by one of the instruction books such as *30 Hour Basic*. As a result we can now write programs in Basic which fulfil our needs.

But where do we go from here? Like Mr Battersby I would like to extend the memory of my BBC B, but if I purchase a shadow RAM board I am not sure what it will do for me nor how it will operate.

I too find that a great deal of pre-knowledge is assumed by too many writers and I regret to say that *Acorn User*'s are among these. I think the reason for this is so many of the younger users today have a good knowledge of computers instilled into them at school or technical college where computer technicalities are commonplace. But where does that leave the oldies?

P D C Woollerton
Isle of Wight

JARGON BUSTERS

Sir, I could not agree more with Brian Battersby (September) concerning the assumptions made by authors on the knowledge of users. It also extends to software houses and may well explain some of the fall-off in trade. Many must have just got fed up trying to understand incomprehensible manuals. I do not need to be an electronics engineer to make the microwave oven work.

Has a beginner managed to transfer *Masterfile II* to *ViewStore*? It tells you use 'import' in the manual. There's also a bit on the 'Report' utility. It took hours to sort out because it says that field names *can* be enclosed in delimiters, when it should have said *must*.

There is enormous scope for articles in *AU* explaining the use of commercial software to those like myself who have no wish to become programmers. I like the pre-read by a non-technical person suggested by Mr Battersby, too. You could have a couple of hundred volunteers from your readership at the drop of a hat.

Come on, give us *users* a look in and give the programming freaks a rest.

J A Brook
Worcestershire

Calling all readers ... We have taken up Brian Battersby's idea and are looking for readers who are prepared to examine *Acorn User* from a non-technical point of view.

If you would like to help, write to the Editor at Acorn User, 141–143 Drury Lane, London WC2B 5TF, stating your age, experience and interests. Please mark the envelope 'Jargon Busters'.

HIGH SPEED DELIVERY

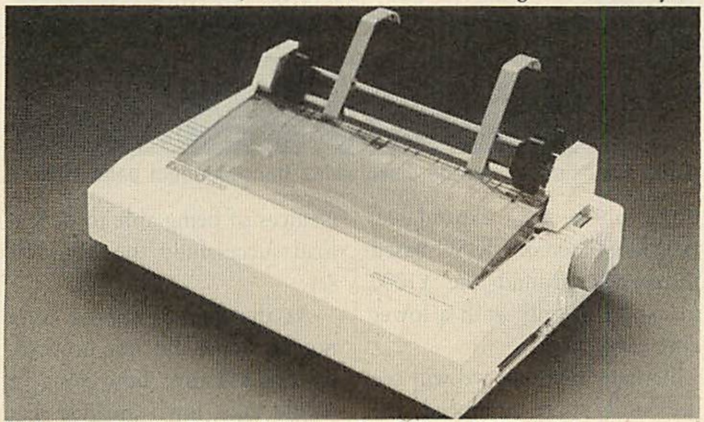
Sir, I am writing to you in praise of Acorn. I refer to the article published in your August issue regarding the malfunction of the CMOS RAM battery in the Master micros.

On returning from holiday, I tried for three weeks to get through to Acorn about the malfunction, but all the lines were busy.

However, on 5 August, I got through to Acorn and informed them of my problem; they put me in touch with a local dealer, who unfortunately had no battery packs, so I re-contacted Acorn who said they would despatch one in the post. This was at 3pm on the 5th.

Lo and behold, at 9 o'clock the following morning a new battery pack and nest was delivered to me – just 18 hours later. Well done Acorn!

Kevin Etheridge
Surrey



Praise for Martin Phillips' tips on the Citizen 120D printer

COMPLETING THE JIGSAW

Sir, I am delighted to find in this excellent magazine the occasional lost soul. I am not alone. Others have recognised that many authors assume the reader to have mundane basic knowledge. However, I rejoice when I find a clear and concise form of assistance. I refer to Martin Phillips' August Hints and Tips on printers, and especially the list of control codes on page 63. I'd just purchased a Citizen 120D printer and this page was a boon. So much so there is now a photostat copy next to the machine.

Rarely, as I struggle to gain the understanding and skill to become a good user, do I comprehend an article in total. Some small part is grasped and another piece of the jigsaw falls into place.

Many adverts use an abbreviated form which is cost conscious and confusing. Fine if you understand the dialect. TPI can be threads per inch, teeth per inch or, I assume, tracks per inch. A little thought would be a tremendous help to those who struggle. I have and will continue to enjoy that which I have understood.

J C Scott
Angus

Martin Phillips did a follow-up article in September. J C Scott also supplied an ode on the computer, which was too long to reproduce in full, but here's a snippet:

The computer experts, the language they use
Is certain, I'm sure, bound to confuse,
The esotoric manner that they employ,
Does it give them erotic joy?

Teachers might like to know that Martin Phillips tackles printers and disc drives in *School Computer User*, a free magazine for schools distributed by education authority computing advisers. Contact Redwood Publishing, 141–143 Drury Lane, London WC2B 5TF.

BACK TO THE FUTURE

Sir, It was a pleasure to read your comments in the 50th issue. So rarely do we see in print the thoughts of the Guru himself. I offer further thoughts for interest.

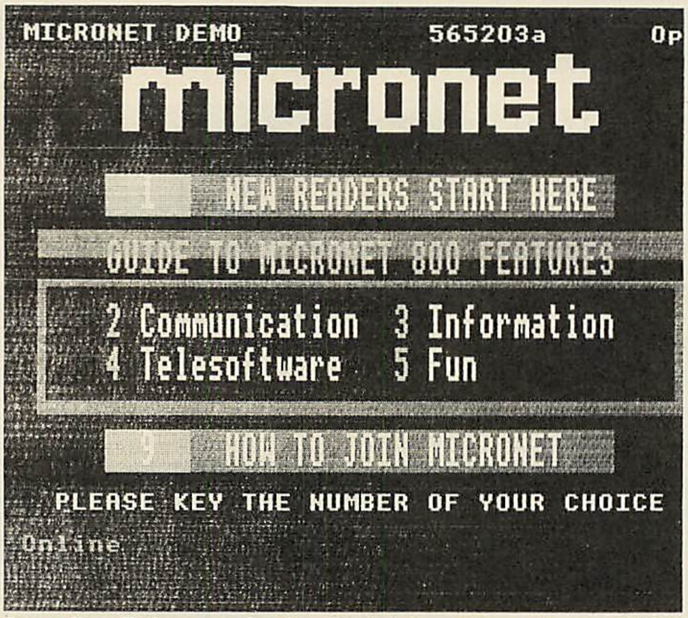
An interesting year? Well, maybe . . . but not because of Acorn. I found the Master a real let-down. With one true ROM socket, plus the ability to add £14 to the cost of a ROM to put it in one of only two cartridges; no speech hardware; the same old processor, limited to a 64k address space. I understand Acorn's reasons – it couldn't be any other way and still maintain compatibility with most software and hardware add-ons. But that doesn't make it a good computer in a market where computers start at 512k with a 16 bit processor and at lower prices than a Master.

I'm also sorry to hear that you think the Master 512 is a good computer. Even with hard discs running at the Acorn User Show, the machine still looked slow, especially in colour. As for value for money . . . who are they kidding? A Master 512 costs about £800 without monitor or disc drives. An Atari 520ST with the same memory, but a 68000 8MHz processor and Gem running somewhat faster costs £399 without monitor or disc drives. I've never been keen on Atari 'games machines', but neither am I so blinkered that I fail to see the advantages of its powerful ST range.

Now take the RISC processor . . . there's a really superb little beast. This could bring Acorn back into the running in all markets. It knocks spots off its competitors on speed and cost. But can Acorn excel its brick-like marketing and PR (you said it) and sell a tidy, all-in-one, expandable, fast, large memory RISC-based micro for around the £1000 mark? Hopefully with a lower cost entry point?

Perhaps one day we will see the skills that produced the BBC micro all those years ago.

Rob Pickering
Computer Concepts



Acorn User **listings can be downloaded from Micronet page 600611**

ECONET EXPERIENCE

Sir, The Network Page from Robin Newman in your June issue was a welcome acknowledgement of the existence of Econet. I hope it was not a one-off.

I was also pleased to see that all your listings were to be available on Micronet. However, when I looked there I found two disappointments.

First, although I had the August magazine in my hand, the programs available were the July ones. You should aim to have the programs to match the current magazine!

Secondly, the programs were not available separately.

There would seem to be two snags here. Usually users are not interested in all the programs on offer, and – much more relevant – what are the chances of being able to download successfully the complete set?

As the ones I wanted were not on line I did not proceed, so don't know how long it would take, but I imagine that the time taken would almost make up the 75p difference between the Micronet price and the disc price – in addition to which I would have to supply my own disc. It does not seem such a bargain when looked at like this.

Mike Harrison
Edinburgh

Robin Newman's article is the start of a series in *Acorn User*. Robin's second article was in October, and this issue carries a review of SJ Research's fileserver for Econet.

***Acorn User* has helped set up several Econet user groups, and the magazine's publisher's Redwood, has a 30-station Econet running from a Master Turbo. *Acorn User* and four sister magazines are run by 50 people without a typewriter in the building! Last month saw the launch of our Network Utility disc which was written in-house.**

We have been making free software available on Micronet for some time, and the availability of the monthly disc was a trial. It has been successful and we are looking into possible alterations. It is not as simple as the idea sounds, but then it never is.

DOWNLOADING DRAWBACKS

Sir, The process of typing in listings from the Yellow Pages of *Acorn User*, and of correcting the mistakes inevitably made by clumsy fingers, can be quite enjoyable, but masochism sometimes palls – especially when the programs are long. An alternative would be to purchase the monthly disc, but to do so would mean buying a miscellany of listings that might be of no great interest: arcade games and the like. For example, a working version of September's *Romfile* would be a useful acquisition, but I am not enthralled by *Maze*.

Downloading from Micronet is an attractive and slightly cheaper idea but, with your current policy, it carries the same penalties as buying the disc. The one program that I want can only be obtained by a bulk purchase of others.

Because Micronet, like September's Joe's Jottings, is menu-driven, it should be possible to offer your goodies individually, so allowing the customer to pick (and to pay for) only those items that take his fancy.

Peter Howard
Hampshire

First of all, there were errors in the 'File it sideways' article by Mike Rawlings, and 'On the menu' by Joe Telford. Please see the Blunder box on page 18 for corrections and accept our apologies.

Micronet users should send comments on the software service to Mailbox 919992492.

TRANSFER TROUBLE

Sir, Many congratulations to Tessie Revivis on the excellent Tape-to-disc transfer article in May's First Byte. It contained a great deal of clear, understandable and helpful information. But what happened to listing 2? I couldn't find it.

I was hoping the listing would help me develop a standard intro to add to taped programs so that when CHAINed from disc the sequence of LOAD downloader, LOAD prog, *TAPE, RUN downloader, RUN prog would be carried out automatically. If feasible such a procedure would be better than the separate operations hitherto described in articles.

It would also reduce the cries for help when other members of the family use the Beeb and don't appreciate the need for downloading. Is my idea at all practical?

I would also welcome your help on the question of sending commands to my Taxan KP-810 printer from the BBC micro keyboard.

Having enabled the printer (VDU2 or CTRL-B) all codes sent are printed out every time Return is pressed. Is it possible to send codes without them being printed out?

M Askew
Malvern

Listing 2 from the Tape-to-disc article went missing from the Yellow Pages. This is reproduced below. This listing provides the sort of 'turnkey' system you describe. Add the first line to the start and the rest at the end of your programs. You may need to alter the numbering of the routine to suit your own program: remember to alter the GOTO in line 10 as well. Your program can then be CHAINed from disc in the normal way. It will automatically relocate itself and run.

As to your problem with the control code commands being printed, the answer is simple. Keep the control codes on the same line as the VDU2 command. So, to enable your printer and switch it to NLQ mode use VDU2,1,27,1,40.

```
   10 IF PAGE>&E00
 GOTO 10000
    :
  your program
    :
10000 REM Relocati
on Program
10010 *TAPE
10020 *KEY0 F.X%=0
TO(TOP-PA.)S.4:X%!
&E00=X%!PA.:N.:PA.
=&E00¦MO.¦MRUN¦M
10030 *FX15
10040 *FX138,0,128
10050 END
```

ELECTRON DISC DEARTH

Sir, After reading Mark Richards' letter in your September issue I feel I must write in support of the way *Acorn User* covers the Electron.

I purchased my Elk two years ago and have added a Plus 1, ACP Plus 4 disc interface, Cumana CS400 disc drive, Panasonic KX–P1080 printer and *View*. Although it is not a BBC micro system I like to think it comes close. *AU's* articles generally apply to the Electron and I find that incompatibility is the exception rather than the rule.

I also find that merchandise for the BBC advertised in the magazine is quite compatible, and this gives me an opportunity to become fully aware of the overall market place.

Obviously the Electron is not all that a BBC micro is, (after all BBC micros cost a lot more) and it has its limitations. However, to suggest that it should be treated as if it were from a different stable is, in my opinion quite wrong of Mr Richards.

On to another matter of interest to readers, particularly those with the Plus 4 disc interface. I find it surprising that a large software house such as Superior is unable, or unwilling to supply Electron versions on disc, particularly when the DFS is 100 per cent compatible with the ones they are producing for the BBC micro. Disc versions are available for BBC micros but not for the Electron.

Perhaps you could shed some light on this peculiar practice by Superior (and any other software houses), since the number of Electrons with disc drives is rapidly increasing.

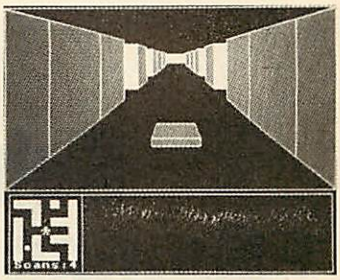
D Rhodes
Yorkshire

We spoke to Steve Botterill of Superior and he explained that the demand for Electron disc software was too low to justify a special version. They had received only a few requests, mostly for 3.5in discs. However, he added 'If the demand is there we'll supply it. If we get say 500 letters then that will justify it.'

STUCK IN THE MAZE

Sir, I have typed in the game *Maze* from the September issue and am having difficulty in getting it to run. All I get is a blank screen.

The problem seems to lie at line 470, and the program does not get beyond this line. I have inserted a 'Print I%' line into the FOR-NEXT loop, and have found that the value of I% is only reaching 108 and not 500. I have also programmed a FOR-NEXT loop from 0 to 500 and the computer seems all right. I am using an Electron with no add-ons.



Maze: tips to get out of trouble

I would be grateful if you could provide me with an answer to this problem.

Andy Adams
Cambridgeshire

It is hard to help you on this as we know for sure that the program works and you have only sent in one line. However, the line you refer to does poke directly into memory locations from 'M%' onwards so check line 330 where M% is set to &2E00. If this was some other value then nasty things might happen!

TAKE THE MONEY AND RUN

Sir, It was sad to see at the recent Acorn User Show that Acorn's 'support' for the Electron has deteriorated to such an extent that it did not even bother to include the machine on its stand. Sales of the Electron last Christmas did a lot to help Acorn's cash flow, but there are now a lot of new computer owners out there who are not going to be very impressed when they find that Acorn has taken their money and run.

Each Electron owner is a potential purchaser of a Master 128 and Acorn cannot afford to disregard them.

If it fails to improve its level of support then it cannot complain when people decide to look elsewhere and upgrade to other manufacturers' machines instead.

David Walton
London

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WINNING BRIDGE HANDS

Sir, First, a little assistance for your September correspondent B Marshall. I've come across two bridge programs.

The first, *Bridge*, is produced by Alligata Software on tape. The bidding isn't great: Stayman but not Blackwood, and it won't go beyond game when bidding as partner or opponents. It redoubles too readily, which is great fun if you know what you're doing. I'd estimate play as of 'goodish beginner' standard. The only real criticism of what is, after all, quite an achievement, is that the quasi-random deal is rather biased towards very long club suits – though pressing Escape allows you to deal a fresh hand without losing progress towards rubber.

The second, *Bridge Mentor II*, is produced by Minic Business Services, on tape or disc. It's a tutor, not a game. You can't bid or play as you wish, as the program makes rude noises if you make an 'incorrect' bid or play, and will only continue when your input matches the stored play. However, the 50 or so stored hands and play really do represent good club standard (the first hand goes INT, NB, 6NT, NB, NB, NB, contract made!). Hints are provided if you're stuck. The facility to archive your own favourite hands will do much more for the development of a beginner than the Alligata product. It runs on the Master as well as the model B; the Alligata one doesn't.

Now, could you help me, please? I need to be able to transmit text quickly between my Master 128 Turbo, and a colleague in the USA whose micro, not a BBC, accesses Bitnet through his university mainframe. Do I have to go through my employer's mainframe, a VAX, myself (which, I'm, told, means a modem, software and a separate VT100 emulator chip), or can I go it alone? That is, would the internal modem about to be produced by Pace for Acorn, together with a subscription to something like Microlink, allow me to access Bitnet down my home phone line?

A D Jankowicz Ph D
Limerick, Eire

Thanks for the bridge facts. Minic is at 12 Woburn Close, Bushey, Herts WD2 3XA. Alligata's address is 1 Orange Street, Sheffield S1 4DW.

In theory, you should be able to access Bitnet from your BBC micro using a modem and terminal emulation software such as Acornsoft's *Termulator*. However, we're not familiar with Bitnet and so can't be definite. Can any readers help?

DATA PROTECTION ACT ADVICE

Sir, I recall reading about a Data Protection Act that was going to be introduced. There was much debate as to whether this would apply to databases kept on a home computer. Now I understand that it has come into force but I cannot remember seeing any detailed examination of its relevance to the home user.

I would like to keep a database of the names and addresses of an art society and a separate database of the names and addresses of members of the public who have bought a work from their exhibitions. My computer has no means of public access. Does the act require me to be registered?

Would this Act apply if I were to store the information on paper (for reproduction by a photocopier) instead of on magnetic media? The potential for mass distribution and unauthorised access would seem to be the same.

J D Pizzy
Uxbridge

The Data Protection Act has already been introduced. Under this Act any computer user storing data on living people had to apply for registration by May 11 this year. The act applies *only* to computer databases, anything on paper is exempt. Application costs £22.

However, the government's Registrar estimates that only around half of the users that should apply for registration have done so. Applications are still coming in at a rate of 500 a week. Unincorporated members clubs are exempt from registration so your members' list would probably be okay. It would still be a good idea to look through the regulations. Your list of people who have brought works would almost certainly require registration. You can get all the information from the Registrar. Write to The Office of the Data Protection Registrar, Springfield House, Water Lane, Wilmslow SK9 5AX.

THE Z80 LIVES ON

Sir, I have been reading *Acorn User* since it started in July 1982, when I had my first computer, an Acorn Atom. Two years ago I bought a BBC B and Z80 second processor.

I was very pleased to see the CP/M Corner in your business pages, until the March 1986 issue when it was stopped. I would be very grateful if you could tell me whether or not the CP/M Corner will be back.

I would also like to tell readers about a very good and interesting C language compiler which can be used on the BBC micro with any Z80 second processor. The compiler is Hisoft C++ for CP/M systems. This is the cheapest compiler on the market that adheres very closely to the Kernighan and Ritchie standard, with the exception of floating point calculations. It should appeal to systems software writers and to those who like to learn a new programming language.

For readers who have no idea about this language, C is a very flexible, powerful and easy to use language that has a number of features that are similar to, but better than, those used in Basic and Pascal.

The compiler comes with a *Wordstar*-compatible screen editor, which can be used to write the C programs and the Basic programs.

As I have finished my first system using this language (which is a front end system similar in concept to the Gem system on the Master 512 for its ease of use and user friendliness) I would be very grateful if you could tell me the best way for marketing this system.

A Mansour
Sheffield

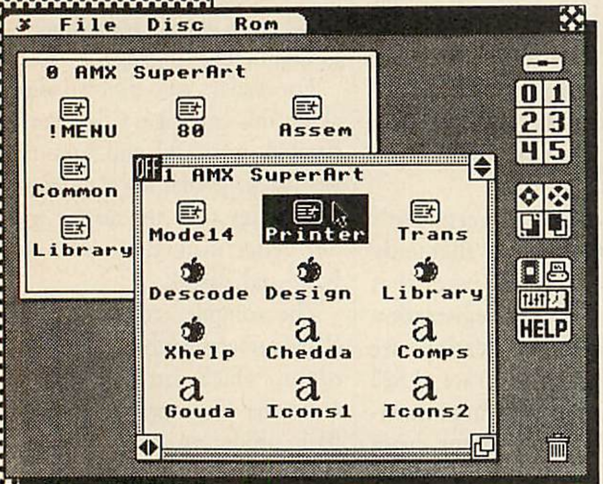
As you may have read in August's issue, Acorn no longer supports the Z80, and our coverage dropped because of the Master's appearance and a strong fall-off in letters about the Z80. However, we will still give coverage to the product, as in this issue's news and reviews section.

For marketing your software, contact companies who are still active or the CP/M User Group at 72 Mill Road, Hawley, Dartford, Kent. Relevant companies include Locomotive Systems, 1 South Street, Dorking, Surrey RH4 2DY; Davis Rubin Associates, 1 Canonbourne, Weston Sub Edge, Glos GL55 6QH; and Technomatic, 17 Burnley Road, London NW10 1ED.

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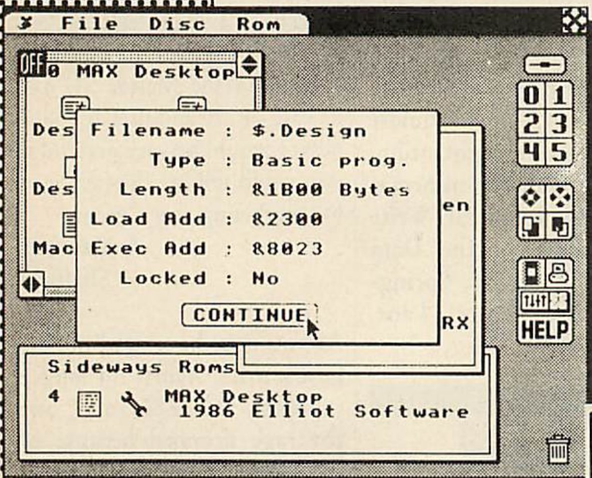
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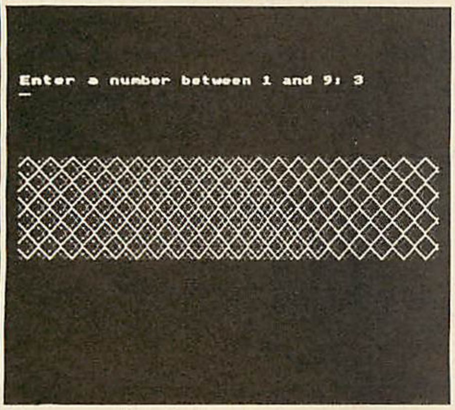
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HINTS & TIPS

Martins Phillips provides handy hints on a scrabble scorer, ponders over true and false plus tips on error messages, a graphics demonstration and directories

ZIGZAG GRAPHICS

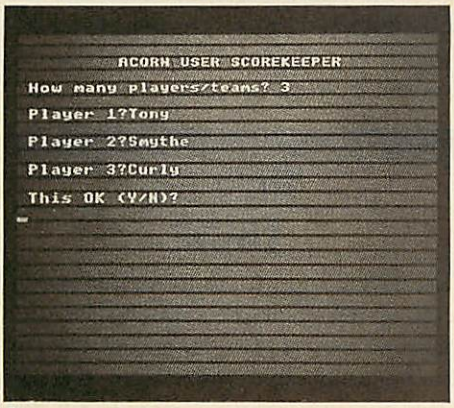


Zigzag graphics demonstration screen

Colin MacDonald, from Lanark, has sent in a short graphics demonstration. Although of little practical use, it does draw some effective patterns.

It draws a series of zigzag lines starting at different heights, but keeping within the same area. To start the program off a number has to be entered in. This sets D% the vertical size of the zigzag. The PLOT 69 command draws a point in the current foreground colour. Pressing the space bar will restart the program. See listing 1 on the yellow pages.

SCRABBLE SCORER



Setting up the Acorn User Scorer

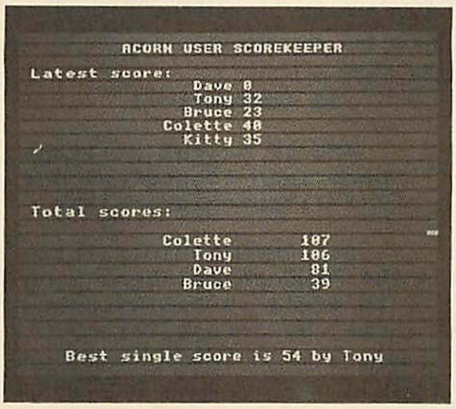
Bernard Emblem, from Bury, has sent in another interesting program, this time to add up the scores for Scrabble (or any other game for that matter). He wins £10 for a useful idea. The program will keep scores for up to nine players or teams by player or team name. Incorrect scores can be corrected by entering negative numbers and the program can be restarted by pressing Escape.

The program (listing 2) is given in the yellow pages and is in four parts. The first part, lines 60 to 170 is the main section of the program. Here three arrays are dimensioned, 'players' stores the player's name, 'score' keeps that person's latest score, and 'totalscore' keeps the total score for each person. Line 70 provides the means to restart the program should Escape be pressed, as this will generate an error.

Until the program is debugged, it would be wise to enter line 70 as follows:

70 REM ON ERROR RUN

otherwise any bug in the program will



Entering the scores on screen

cause it to restart and it is then very difficult to discover why the program is not working correctly. Inserting the REM makes the computer ignore the rest of the line, but you still have the line in the program in the correct place, and the REM is easily deleted once the program functions correctly.

Lines 80 and 90 set mode 6 with blue background colour. Line 100 switches off the keyboard auto-repeat. Again this can be quite a nuisance when curing bugs, as you are not able to use the auto-repeat when copying lines. Either REM the line:

100 REM *FX11,0

or before editing type:

*FX11,10

to re-enable the auto-repeat.

PROCinputplayer is the procedure to input the number of persons playing and their names. Lines 150 to 170 are an endless loop (the variable 'bored' is always false, therefore the condition in line 160 can never be met).

The second part of the program is PROCinputplayer. The title is printed at the top of the sceeen (line 240). Lines 250 to 270 form a routine to input the number of players. Numbers outside the allowed range are trapped and a message is given. Lines 280 to 300 input each player's name. Lastly a check message is printed so that mistakes can be corrected easily.

Line 230 has Bernard puzzled, and it puzzled me for some time too! He says that this line has to be put in to get the title to appear correctly. Without the 'PRINT', the printer is switched on and the title does not tabulate properly. More on this later.

PROCscores is the procedure to update and print out the scores. Before printing each line is blanked out by printing a line of spaces. These are stored in the string 'blank$'. A small point of style here is that the definition of 'blank$' is done inside the main loop of the program so that it is being defined each time an entry is made. It would have been better to define it at the start of the program, where it would only have been defined once.

PROCcentre is a short procedure to centre a line of text. 'A$' is the text to be centred, and 'A' is the line on which it is to be printed.

Now let's return to line 230. Why is the line needed? Before reading any further, enter listing 1 and see if you can find the problem.

The bug is a very obscure one, highlighted in past Hints and Tips pages, but is very difficult to spot. The answer is in a most unexpected place, line 90. This should read:

90 VDU 19,0,4,0,0,0

but the last three zeroes are missing. As with all the VDU calls, an error here does not generate an error message. What does happen is that now the sequence of messages going into the VDU stream is upset with unpredictable results. In this case, a printer is enabled, and the title is not centred correctly. I suspect that this is a bug that you will either have spotted when typing in the listing, or you will check

almost everything else in desperation before finding it. Once line 90 has been corrected then line 230 can be deleted.

In the letter Bernard sent with the program, he expressed a wish to print out the names and scores in order ie, leading score first. There are a variety of ways to do this and many books on programming devote some time to different sort routines, comparing sorting speeds for a given number of sorts. In this case — with only nine players to sort — the speed of the sort routine matters little. It is more important to have a routine that affects the rest of the program as little as possible. One wants to change the working core of the program as little as possible. The following lines need to be added to the program:

```
465 PROCsort
466 FOR N%=1 TO players
467 L%=LEN(player$(sort(N%)))
580 :
590 DEF PROCsort
600 N%=1:s$=" "
610 REPEAT
620 total=-100
630 FOR I%=1 TO players
640 IF INSTR(s$,STR$(I%))>0 THEN GOTO660
650 IF total%(I%)>total THEN total=total%(I%):sort(N%)=I%
660 NEXT I%
670 s$=s$+STR$(sort(N%))
680 N%=N%+1
690 UNTIL N%>players
700 ENDPROC
```

and the following lines need to be changed:

```
60 DIM player$(9),score%(9),total%(9),sort(9)

470 PRINTTAB(1,N%+13);blank$
480 PRINTTAB(20-L%,N%+13);player$(sort(N%));
490 PRINTTAB(21,N%+13);total%(sort(N%))
500 NEXT N%:NEXT X%
```

The sort procedure produces an array 'sort' which contains the ranked order of the players, eg 'sort(1)' will contain the player number of the leading player. A string 'S$' stores the player numbers after they have been ranked, so that they are not considered again. This is a simple technique, but only works because there is a maximum of nine players. The variable 'Total' is set to −100 to allow for possible negative scores. This variable is then used to hold the highest score found for comparison with the rest.

A small change that could be made to the program is to show the best individual score. This can be done in three lines. Add lines 65 and 455 and change line 510. Line 510 was the line which gave the press Escape message, but as the screen display is almost full, the top score was put in the same place.

```
65 topscore=-1

455 IF score%(X%)>topscore THEN topscore=score%(X%):top$=player$(X%)

510 PRINTTAB(0,23)blank$:PROCcentre("Best single score is "+STR$topscore+" by "+top$,23)
```

Lastly, as one who enjoys the odd game of Scrabble, but hates having to wait hours for everyone else to go, I thought it might be useful to have a timed scoring system. This is fairly simply achieved by measuring the time from the previous entry, and if it exceeds a previously defined limit, an automatic score of 0 is given and the next person can go. The following lines have to be added or changed:

```
335 INPUT''"Maximum time allowed (secs) "maxtime:maxtime=maxtime*100

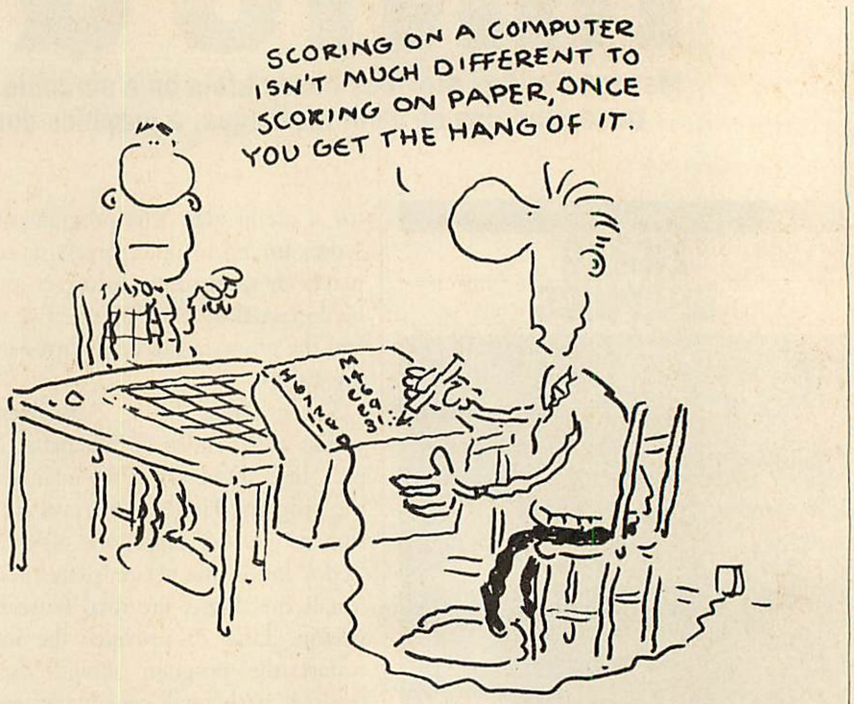
450 PROCtime

710 :
720 DEF PROCtime
730 TIME=0:A%=0
740 PRINT" ";
750 REPEAT
760 b$=INKEY$(100)
770 UNTIL (b$>="0" AND b$<="9") OR TIME>maxtime
780 IF b$="" THEN score%(X%)=0:VDU7,48:ENDPROC
790 score$=b$:PRINT b$;
800 REPEAT
810 REPEAT
820 b$=GET$
830 UNTIL b$>="0" AND b$<="9" OR b$=CHR$13
840 score$=score$+b$:PRINT b$;
850 UNTIL b$=CHR$(13)
860 score%(X%)=VAL(score$)
870 ENDPROC
```

The timing stops as soon as the first number of the score is entered.

If problems are experienced with the timer, it can be halted by entering a zero without pressing Return, then the score can be entered when ready, and the leading zero will be ignored. The procedure is rather complicated, as it will put in a zero score as soon as the time is exceeded.

The final version of this program (listing 3 on the yellow pages) could be extended still further to print the time left for a player, or even for those with a speech system, to speak the time left.



TRUE OR FALSE

The TRUE and FALSE statements seldom crop up directly in programming, and their function is often taken for granted but they are frequently used indirectly in programs. Also the way in which the TRUE and FALSE statements work can be rather confusing. Reading the User Guide provides the information that TRUE = −1 and FALSE = 0, which is not a lot of help. There are actually many uses where TRUE

ILLUSTRATIONS BY IAN DICKS

and FALSE apply. The simplest is perhaps the following loop:

```
REPEAT
....
....
....
UNTIL 0
```

The REPEAT UNTIL loop will only end when a condition is met where some statement or variable is TRUE, ie has the value of −1. In the above example, we have an endless loop. A similar example which has a certain appeal is:

```
bored = 0
REPEAT
....
....
....
UNTIL bored
```

To show how REPEAT ... UNTIL is used in a program, here is a short routine that prints from 10 down. It will stop when the value of N is 0 ie, the condition TRUE is met:

```
10 N=10
20 REPEAT
30 N=N-1
40 PRINT N
50 UNTIL N=0
```

It is actually not quite accurate to assume that such loops terminate only when the condition TRUE is met. To test this out, try the above program but make line 50:

```
50 UNTIL N
```

The program will stop when N=9, but if line 10 is changed to:

```
10 N=1
```

then the program will not end when N=0, but will end when N equals any other number. In other words, the loop will end when *any* condition is not FALSE, rather than when any condition is TRUE. These are not the same! Thus the first REPEAT ... UNTIL 0 loop will not work with any number other than 0.

A more obscure use for the TRUE/FALSE routines is given in the User Guide on page 100. The following line appears illogical and gives a seemingly odd result:

```
A%=2:PRINT A%=0
```

It will return the answer 0, and so will:

```
A%=2:PRINT A%=1
```

but:

```
A%=2:PRINT A%=2
```

will return the value −1. This expression effectively returns TRUE or FALSE. Similarly, using greater than or less than has the same effect. Typing in the statement:

```
FOR A%=-3 TO 3:PRINT A%=0:NEXT A%
```

gives:

```
-0
-0
-0
-1
-0
-0
-0
```

Changing it to:

```
FOR A%=-3TO3:PRINT A%>0:NEXT A%
```

gives:

```
-0
-0
-0
-0
-1
-1
-1
```

This use for TRUE and FALSE can have some interesting uses. It can replace the IF ... THEN statement; for example, instead of saying:

```
IF flag%=17 THEN N%=25 ELSE N%=30
```

you could say:

```
N%=30+5*(flag%=17)
```

The expression (flag%=17) will equal −1 if flag% does equal 17, or it will equal 0 if flag% takes any other value. Therefore 5*(flag%=17) will equal either −5 or 0, thereby assigning the correct value to N%. There are three advantages for this technique. First, there is usually a saving of space, second there is no need for separate lines. This results in more space saving and third, if less space is taken up it follows that speed must be improved. Sometimes this technique can make the program easier to understand.

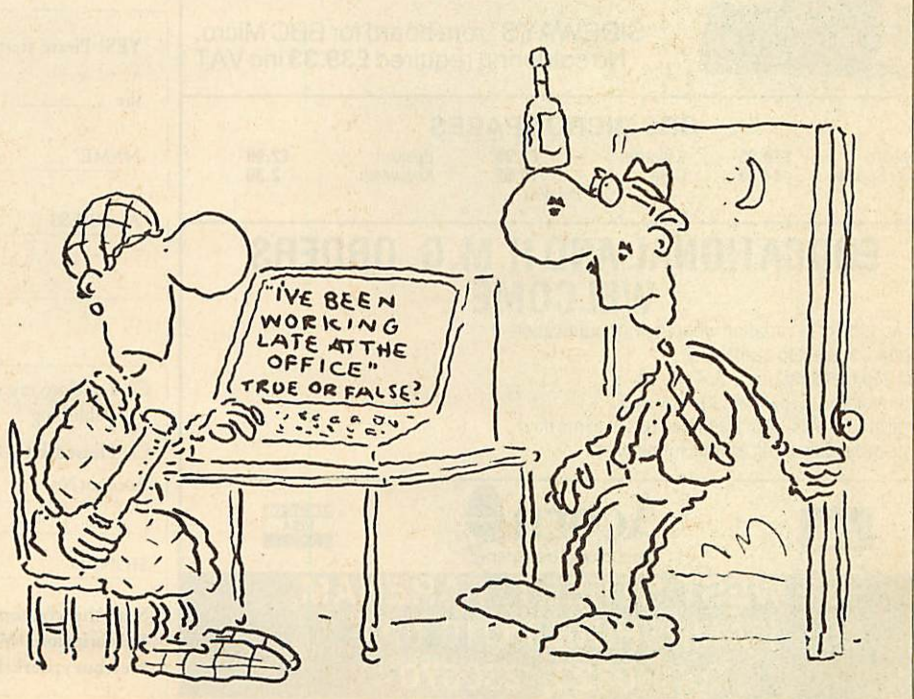
I am sure that there must be many elegant uses for this technique. If you find some good ones, write in with your program. It would be useful to have a similar program which did not use this method for comparison. Many thanks to J R Kelly, from Bewdley, for this contribution.

INCLUDING THEN

For most purposes, the keyword THEN is an optional part of the IF ... THEN ... ELSE structure and is often left out of listings. However, there are occasions when it must be included and there is a brief warning to this effect in the BBC User Guide when used with pseudo variables such as TIME.

One not very obvious example where THEN must be used is if control passes to the machine operating system after the test condition. A machine operating system (MOS) call always starts with a '*'. Examples of MOS calls are *TAPE, *MOTOR, *FX and *CAT.

To demonstrate the point, *MOTOR is used as an MOS call with an immediate and obvious effect – it turns the cassette motor relay and light on and off. Listing 4 will not work as intended, and comes up with a 'No such variable at line 30' error.



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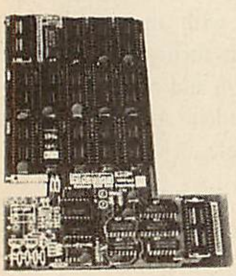
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This is because the asterisk is interpreted in this case as a times sign and the unknown variable is MOTOR 0. The cure is simple . . . put the THEN in, as in listing 5:

```
10 REM listing 4
20 INPUT"Enter 0 OR 1 "N
30 IF N=0 *MOTOR 0
40 IF N=1 *MOTOR 1
50 GOTO 10
```

```
10 REM listing 5
20 INPUT "Enter 0 or 1 "N
30 IF N=0 THEN *MOTOR 1
40 IF N=1 THEN *MOTOR 1
50 GOTO 10
```

FINDING THE MISTAKE

Every BBC micro or Electron user must have come across a wide variety of the Basic's error messages. They are a good guide to where the error lies — but not always. The error handling routines in Basic are quite good, but can be fooled from time to time. This leaves the programmer tearing out hair trying to find the mistake.

Here is an example of the sort of thing I mean. Type the following line:

PRINT TAB(4,12)"HELLO"

This will print the word HELLO on the screen. Now retype, or copy that line, but making a deliberate mistake and leave the trailing bracket out:

PRINT TAB(4,12"HELLO"

The computer will now respond with the message, 'Missing)', which is correct. Now enter the same line, but leave out the other bracket:

PRINT TAB4,12)"HELLO"

This time a different error message is printed, 'no such variable'. This message can be explained when one realises that the bracket actually forms part of the keyword TAB, and without it the computer thinks that TAB is a variable.

Another example can be seen when the comma is left out. Try the following line:

PRINT TAB(4 12)"HELLO"

Now the computer gives the following message:

Missing ,

When the space is left out, no error message is generated as the syntax is valid:

PRINT TAB(412)"HELLO"

All this goes to illustrate the sort of problems that can occur with the error messages. They cannot always point to the exact problem.

In such cases, it is worth taking a different look at the offending area of the program to try to identify the mistake.

MIXED UP FILES?

If you get disc programs mixed up with *Wordwise* files or data files then save each type of file under a different directory. I always save *Wordwise* files in the W directory, *View* tiles in the V directory, data files in the F directory, and spooled files in the S directory and so on. Looking at the catalogue it is then easy to sort the normal programs from the various types of files eg, to save a series of *Wordwise* notes using the W directory use the following filename:

W.NOTES

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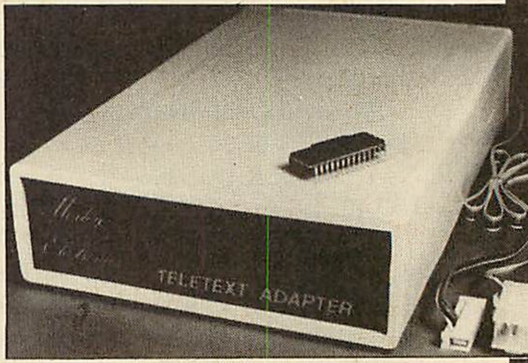
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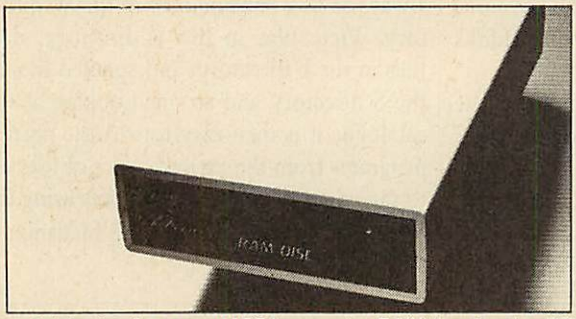
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FIRST BYTE

LOGICAL OPERATORS

This month we will explore learning to program in machine code

Tessie Revivis

We return to the machine code theme this month with more of a programmer's eye. In the August and September editions of First Byte you will have seen how easy it is to enter and use an assembly language listing. You may not have understood exactly what was happening but hopefully those 'machine code' barriers will have been broken down and you will have looked upon assembly language listings in *AU* as a challenge rather than a hindrance. In short, you don't have to be capable of writing a machine code program to be able to enter and use one! In this and future issues (though not necessarily each month) we'll be looking into the subject of actually learning to program in machine code while relating it to Basic when possible.

Several machine code instructions have direct counterparts in Basic. Three such instructions are AND, EOR and ORA, the last one being OR in Basic. These three instructions act identically to their Basic equivalents, acting directly on a byte of information altering it in a specific way. Because the action of each is fixed and predetermined it is said to be logical and — not surprisingly — the three instructions are often referred to as logical operators.

All three logical operators require two items of information in order to act. The first item is the data we wish to modify. In machine code this will be a single byte held, for example, in the accumulator. The second item of data is called the mask — this is the byte which will determine the type of result obtained when the instruction is carried out.

Each of the logical operations takes place at bit level, in other words each bit of information that makes up the mask byte affects its corresponding bit on the data byte. This will become clearer when we examine a few examples, so let's start with the AND instruction.

Each logical instruction has four rules associated with it determining the outcome of the operation. For the AND instruction the four rules are as follows:

0 AND 0 = 0
1 AND 0 = 0
0 AND 1 = 0
1 AND 1 = 1

The result of an AND operation therefore can only ever be 1 if both the bit in the data byte and the corresponding bit in the mask byte are 1. By choosing the mask byte very carefully it is possible to use the AND instruction to mask out certain bits in a byte of information. For example, suppose we wish to mask off the top bits in a byte so that the byte will only contain a result returned in the lower four bits. To do this we must AND the data with 0000 1111, 15 or &0F. The logic being that only the bits set can return a result. As all the top bits of the mask byte are 0 they can only ever return zero. Let's prove it by supposing that our data byte is &99. In binary terms this becomes 1000 1001. Writing the logical operation out at bit level we obtain:

data byte (&89)	1001 1001
mask byte (&0F)	0000 1111
AND	———
result (&09)	0000 1001

As you can see the top (most significant) four bits have been 'masked-out' and the lower (least significant) four bits have been preserved. This is in fact identical to the way in which Basic's AND command works. Try entering the following line:

```
PRINT &89 AND &0F
```

and see that the result is indeed &09.

Listing 1 illustrates how the masking ability of the AND instruction can be put to good use. Here it is used to convert a 'decimal' hex number stored in the location 'temp' into its two ASCII character equivalents. Thus if temp contained &73, the program would convert this into an ASCII 7 and an ASCII 3 — printing them on the way. The term decimal-hex has been coined because the program as it stands will not handle the alpha hex letters A, B, C, D, E and F.

```
   10 REM Demo of AND instruct
ion
   20 REM by Tessie Revivis
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User Novem
ber 1986
   50 :
   60 DIM code% 100
   70 temp=&70
   80 osasci=&FFE3
   90 PROCassemble
  100 ?temp=&73
  110 PRINT''"The value is: ";
  120 CALL code%
  130 PRINT
  140 END
  150 :
  160 DEF PROCassemble
  170 FOR pass=0 TO 3 STEP 3
  180 P%=code%
  190 [OPT pass
  200 LDA #ASC"&"
  210 JSR osasci
  220 LDA temp
  230 LSR A:LSR A
  240 LSR A:LSR A
  250 CLC
  260 ADC #ASC"0"
  270 JSR osasci
  280 LDA temp
  290 AND #&0F
  300 CLC
  310 ADC #ASC"0"
  320 JSR osasci
  330 RTS
  340 ]:NEXT
  350 ENDPROC
```

Listing 1. The masking ability of AND

The first action of the program (after printing the &) is to isolate the high number information, as this is the first one to be printed. This information is held in the high four bits of the byte. These are shifted across into the low four bit position using the instruction LSR — Logical Shift Right — which works identically to the ASL instruction (described in September's First Byte) but in the opposite direction (lines 230 and 240). The high digit is now sitting in the low digit position. To convert this into an ASCII code we simply add ASC"0", ie, if it is 2, then adding ASCII "0" will result in the code for ASCII "2".

This can then be printed. It is handled in lines 250 to 280.

The use of the AND instruction comes in line 290 where it is used to mask off the high four bits of the byte, which have been restored, to leave the value of the low digit intact, to which ASCII "0" can be added and printed.

Like AND the ORA instruction has its OR equivalent in Basic. ORA has four simple rules which determine the outcome of the ORA operation between data and mask bit. The rules are:

0 OR 0 = 0
1 OR 0 = 1
0 OR 1 = 1
1 OR 1 = 1

If one of the bits under test is a 1 then the result is a 1, regardless of the content in the other bit.

The ORA instruction is most often used to force a bit, ie, to make sure that a particular bit or bits are set. Listing 2 is a cut down version of listing 1 which uses the ability of the integer variable A% to be passed into the accumulator. Whenever a machine code program is called, the part of the Basic interpreter which hands control to the machine code first takes the low byte (there are four per integer variable) of the A%, X% and Y% variables and deposits them into the accumulator X and Y registers respectively (note they do not pass results back in this same way!). A value is passed via A% in line 100. The program will ensure that any number edited into line 100 is always printed out as an odd number. This program shows that 4 is assigned to A% but 5 will be printed. If you edit line 100 to save A%=5 then 5 will still be printed.

The reason is that we are forcing a 1 by ORAing it in line 210 of the program. The bit map for this is shown below. Work through it for yourself using the four ORA rules above.

Data byte (&04)	0000 0100
Mask byte (&01)	0000 0001
AND	________
Result (&05)	0000 0101

The final logical instruction is EOR. Unlike AND and ORA it does not have a direct equivalent in Basic. EOR stands for Exclusive OR and if we examine the four rules the aptness of its name should come to light. Those four rules are:

0 EOR 0 = 0
1 EOR 0 = 1
0 EOR 1 = 1

```
   10 REM Demo of ORA instruct
ion
   20 REM by Tessie Revivis
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User Novem
ber 1986
   50 :
   60 DIM code% 100
   70 temp=&70
   80 osasci=&FFE3
   90 PROCassemble
  100 A%=4
  110 PRINT''"The value is: ";
  120 CALL code%
  130 PRINT
  140 END
  150 :
  160 DEF PROCassemble
  170 FOR pass=0 TO 3 STEP 3
  180 P%=code%
  190 [OPT pass
  200 AND #&0F
  210 ORA #1
  220 CLC
  230 ADC #ASC"0"
  240 JSR osasci
  250 RTS
  260 ]:NEXT
  270 ENDPROC
```

Listing 2. A cut down version of listing 1

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1 EOR 1 = 0

The only time a bit results in being 1 (or set) is exclusive to the OR situation when the bits under test are dissimilar. If the bits are alike then the result is a 0.

One effect of the EOR instruction is that you can use it to invert all the bits in a byte, in otherwords if the bit is a 1 it becomes a 0, and if the bit is a 0 it becomes a 1 – this is called flipping the bits. To do this the byte must be EORed with &FF as this example shows:

Data byte (&78)	0111 1000
Mask byte (&FF)	1111 1111
EOR	
Result (&87)	1000 0111

The example above shows that the bits have all been swapped. The most interesting side effect is that if we now EOR the byte again with &FF we obtain our original data (try it for yourself and see).

This is all shown in full colour with listing 3. This uses the EOR instruction to change the composition of a block of 256 bytes on the screen, so that each time you press a key, the block will alternate between yellow and red, simply by passing the bytes through an EOR loop. This can be put to good effect in all types of situations that use graphic displays and you might like to try incorporating the assembler in listing 3 into your programs.

Listing 3 contains a number of instructions that we have not looked at so far but which we will be covering at a future date. For those of you who want a program discription here it is:

Lines 190, 200: set registers

Lines 210, 240: set up block on screen using absolute addressing

Lines 260: test for keypress

Lines 280-330: get byte, EOR it and then save it.

When you run listing 3, you will enter an endless loop as the program is re-executed by the JMP instruction (which is just like a GOTO in Basic). To get out of this try pressing the Escape key. You end up in an endless loop with the program whizzing through at a rate of knots and the only way out is to press the Break key (type OLD to get your program back).

A golden rule of machine code programming on the BBC or Electron micros, is that whenever you test for a key-press you must also test to see if it is the Escape key. If it is, acknowledge the Escape condition via a *FX call to the MOS. This is done very simply as follows:

```
   10 REM Changing Screen Colo
urs
   20 REM by Tessie Revivis
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User Novem
ber 1986
   50 :
   60 DIM code% 100
   70 screen=&4000
   80 osrdch=&FFE0
   90 PROCassemble
  100 REM *SHADOW 1
  110 MODE 1
  120 CALL code%
  130 END
  140 :
  150 DEF PROCassemble
  160 FOR pass=0 TO 3 STEP 3
  170 P%=code%
  180 [OPT pass
  190 LDX #0
  200 LDA #15
  210 .loop
  220 STA screen,X
  230 DEX
  240 BNE loop
  250 .again
  260 JSR osrdch
  270 LDX #0
  280 .eor
  290 LDA screen,X
  300 EOR #255
  310 STA screen,X
  320 DEX
  330 BNE eor
  340 JMP again
  350 ]:NEXT
  360 ENDPROC
```

Listing 3. Changing the composition of bytes

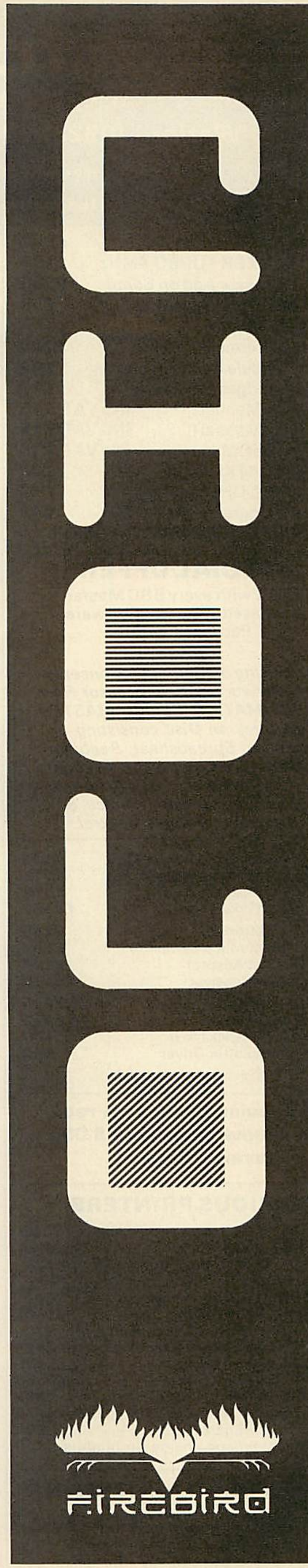
```
JSR osrdch          / read keyboard
CMP #&1B            / was it ESCAPE?
BNE notescape       / no, GOTO notescape
LDA #&7E            / *FX number
JSR &FFF4           /do *FX
.notescape
```

Again there are a number of new instructions that will need looking at, but that does not stop you using it in your own programs. In the meantime add it to listing 3 and press Escape to see that the micro just continues operating as though nothing had happened!

Machine code articles

The following back issues of *Acorn User* may be of interest:

Machine code graphics – July 82, November 82
Machine code shell sort – December 82
Two pass assembler – January 83
Finding a home for machine code – February 83, April 83
Problems with machine code programs – September 83
Saving Basic as machine code – October 83
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1,000 Sheets 15" × 11" Fanfold Paper	**£9**
Teleprinter Roll (Econo paper)	**£4**

Carriage on 1,000 Sheets £1.50

PRINTER LABELS
(On continuous fanfold backing sheet)

1,000 90×36mm (Single Row)	**£5.00**
1,000 90×36mm (Twin Row)	**£4.90**
1,000 90×49mm (Twin Row)	**£7.50**
1,000 102×36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

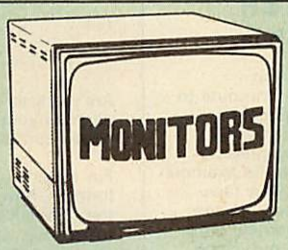
Acorn/Olivetti JP101 Spark Jet Printer

One of the main problems with most printers is that they are hopelessly noisy. How often have you wanted to print something late at night but not done so for fear of waking the children? Also ideal for those working in quiet environments such as libraries, etc. Silence the complaints with the serious solution from Watford at the amazing cost of only

£65

Pack of 4 refills **£10**

JP101 Sparkjet Dump Rom £15



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

- 1431 – Medium resolution as used on the BBC television computer programme **£172**
- 1451 – High resolution, suitable for word processing in mode 0 .... **£225**
- 1441 – High res, exceeds the capabilities of the BBC micro **£365**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£259**
- **TOUCHTEC** Touch Screen Pack **£250**
- Dust Cover for Microvitecs **£5.50**

KAGA/TAXAN 12"

- KAGA KX1201G Hi-res Green Monitor **£90**
- KAGA KX1202G Long persistance Hi-Res Green Monitor **£98**
- KAGA KX1203A Ultra-Hi-Res Amber Monitor **£98**
- **KAGA Super Vision 3,** Ultra Hi-res, RGB Colour; Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£320**

- PHILIPS 12" Hi-Res Amber Monitor **£69**
- PHILIPS 14" Hi-Res, dark-glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono connectors. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display.

ONLY £199

FIDELITY COLOUR MONITOR

- Medium Resolution, attractively finished, 14" RGB and Composite VIDEO/AUDIO Input. Has a detachable anti-glare screen. **£165**

ZENITH

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith Micro Systems.)

Green (New Design) Hi-res **£69**
Amber (New Design) Hi-res **£76**

LEADS

BNC Lead for Zenith or Philips **£3**
RGB lead for KAGA **£3**

N.B. Carriage on Monitors **£7** (securicor)

SWIVEL BASES
for Video Monitors

Adjust your Monitor/VDU, Up, Down, Right or Left to provide utmost in operator flexibility & Viewing comfort. It improves your sight lines & reduces stress & eye, neck and back strain. Available in 2 sizes:

for 12" Monitors **£12** (carr. £2.50)
for 14" Monitors **£16** (carr. £2.50)

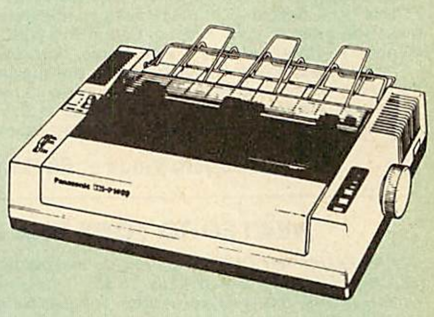
BBC MICRO BUSINESS/ WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE
BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40/80 track double sided Disc Drives, Zenith Hi-Res green monitor, Brother HR15XL professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £949

Panasonic KX-P1080
FREE BBC Micro Cable



From the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Available NOW at a superbly realistic price, the KX-P1080 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 100 cps of clear Draft text backs up the crisp 20 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

The draft text is implemented with a 9 × 9 matrix, with Near Letter Quality effected by means of an 18 × 18 matrix.

As an extra special bonus to all Watford customers purchasing the KX-P1080 NLQ Printer, we are currently providing not only 1,000 sheets of fanfold paper completely FREE of charge but also a printer lead to connect the marvellous KX-P1080 to a BBC Micro, absolutely FREE. These gifts alone are worth £15.

Introductory Price: **£155** (carr. £7)

(FREE with every KX-P1080 printer purchased this month, 1000 sheets of Fanfold Paper, and a Printer Cable for the BBC Micro)

Continued →

MARK 2 LIGHT PEN

You no longer have to fiddle with the brilliance control or work in the shade as this NEW Mark II Light Pen is totally insensitive to local lighting conditions. It only operates on high frequency light from the TV or Monitor.
The red LED Indicator on the Mk II pen, lights up when valid video data is available. Your program can have access to this signal allowing computer verification of target for high res drawing. The conveniently located switch on the pen body allows the computer to ignore any stray signals. Supplied complete with the sophisticated PEN-PAL Software on Cassette or Disc. Please specify.

Mark II Light Pen **£17**

THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED (BOOK)

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.
However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.
Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.
This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.
It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

WATFORD TOPS THE DFS CHART

Watford's Ultimate DFS has scored highest points in ACORN USER's unbiased DFS's Review of July 1985.
In concluding, the reviewer writes "It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price". (Please write in for comprehensive details.)

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for three years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. (P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).

PRICES

- *Complete Disc Interface Kit incl. DFS ROM & fitting instructions* **£56**
- *Watford Disc Interface Kit* **£58**
- *Acorn's 0.90 DFS Kit complete* **£52**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs)*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£46**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£35**

Watford Electronics DDFS PLUS for the BBC B Plus

The Watford DDFS Plus, written specifically for the BBC B Plus Microcomputer, replaces the 1770 DFS from Acorn. It not only provides BOTH, single and double density operations in DFS mode, but the DDFS Plus also permits the use of an extended catalogue, giving 62 files per catalogue. It also incorporates all those excellent features of the popular Watford DFSs, and more.

N.B. SRAM and Tube functions not duplicated.

DDFS PLUS (for BBC Plus) **£30**
(Price includes comprehensive manual)

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

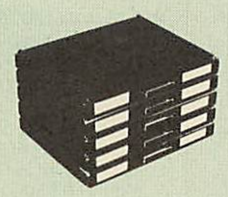
Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS **£4**

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

STAK-PAK



The unique computer program filing and storage system. Made of tough black plastic, these compact drawer sections hold two cassettes each and lock together vertically to form miniature cabinets of any height. Each drawer section has two C12 Data Cassettes with labels plus external index card.

Five twin Packs incl. 10 Cassettes Only: **£5**

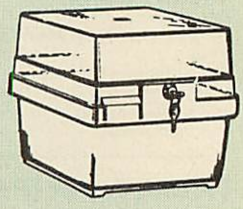
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

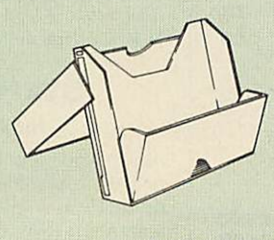
£8

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



- M35 - holds upto 50 discs **£8**
- M85 – holds upto 95 discs **£11**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). Both are of Japanese manufacture.

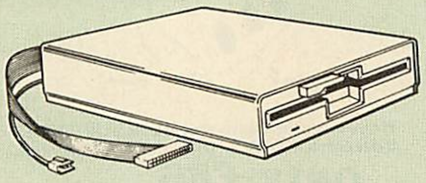
All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. *Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro. Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.*

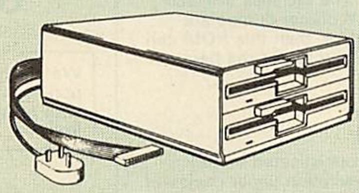
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. We are now able to supply all single disc drives in Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives; allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space; your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. *(Turn to the 10th page of our advert for the Plinths).*

P.S. All our 5¼" Disc Drives are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £99	
400K (720K)	CLS400S £97	CLD400 £165	CS 400S £110	CD400 £189
800K (1.44M)		CLD 800S £183		CD 800S £205

● TWIN Disc Drive Case, complete with Power Supply & Cables **£35**
Securicor carriage on Disc Drives £5 to £6

Prefix **C** = *Cased Drive*
L = *Less PSU*
S = *Single*
D = *Double*

Suffix **S** = *40/80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × 5¼" S/S D/D 40 Track Diskettes* **£10**
- *10 × 5¼" D/S D/D 40 Track Diskettes* **£12**
- *10 × 5¼" S/S D/D 80 Track Diskettes* **£17**
- *10 × 5¼" D/S D/D 80 Track Diskettes* **£17**
- *Hi-Density 1.6M D/S D/D for IBM* **£32**

- *10 × 3½" S/S D/D 40/80 track Discs* **£20**
- *10 × 3½" D/D D/D 40/80 track Discs* **£27**

TOP QUALITY 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 ×* **M4** *S-S D/D 40 Track Discs* **£9**
- *10 ×* **M5** *D/S D/D 40 Track Discs* **£11**
- *10 ×* **M7** *D/S D/D 80 Track Discs* **£15**

- 3" *Double Sided Discs* **£4** *each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

Type	Description	Pack of 20	Pack of 50
M4	Single/Side Double/Density 48TPI	£16	£40
M5	Double/Side Double/Density 48TPI	£20	£52
M7	Double/Side Double/Density 96TPI	£27	£65

BULK PACK DISCS in lots of 100

Type	S/S 80T	D/S 80T
● Without Sleeves	£49	£74
● With Sleeves	£50	£75

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050;** 30 Megabytes **£1549**

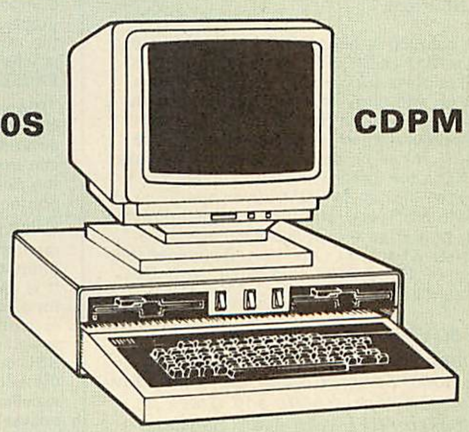
WATFORD's WINCHESTER DRIVES

- 20 Megabytes with ADFS **£635**
- 40 Megabytes with ADFS **£999**

WINCHESTER WORKSTATION

20 Megabyte Winchester, plus a Tape Strimmer and a 400K Floppy Drive all housed in a plinth with cooling fan **£1499**

CDP 800S **CDPM 800S**



Twin 800K Double sided 40/80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £235
CDPM 800S for Master £245
(Securicor Carr. £7)



Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00
(Hi-View compatible)

THE NLQ DESIGNER

(The First & still the Best)

KAGA KP810/910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

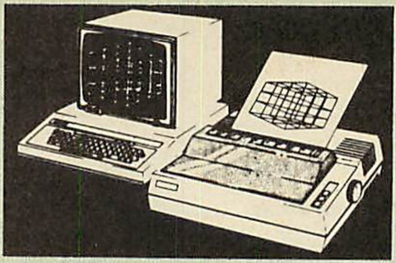
A 40 or 80 track (please specify) FONT Disc containing 9 Fonts, (Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print, Gothic and Greek is now supplied FREE with every package.

(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

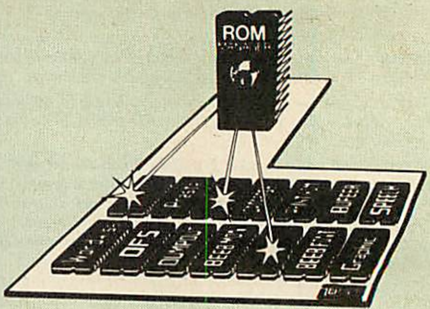
"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Mannesman Tally etc.
Price including comprehensive manual

£25

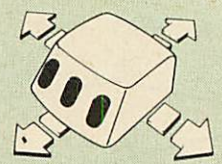
ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.
Many more facilities available.

SPECIAL OFFER £18

THE AMX MOUSE



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £65 (carr £1.50)

We are giving away, absolutely **FREE**, our popular Colour Art software package worth **£15** with every AMX Mouse packaged purchased from us.

AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£42**
AMX PAGE-MAKER Pack Best desk-top publishing software Works with keyboard, joystick and AMX Mouse	**£39**
AMX 3D ZICON Disc	**£20**
AMX Database Disc	**£20**
AMX XAM Educational	**£20**
AMX MAX: A gem of desktop (ROM)	**£17**

RB2 MARCONI TRACKER BALL

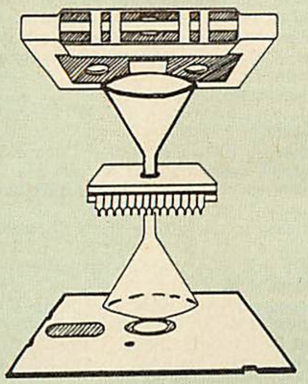
This popular unit is supplied complete with software. Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

TRANSFEROM

(Tape to Disc Utility)



Not compatible with 1770 DFS.

This advanced and sophisticated utility ROM for the BBC Micro has the following features:

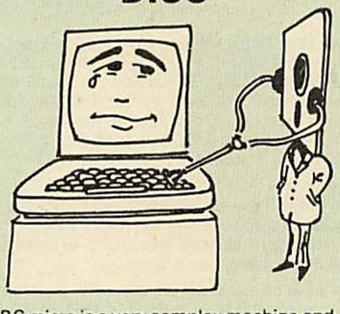
- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£25.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £35**

Please specify 40 or 80 track disc when ordering.

ROM-SPELL

"way ahead of any competition"



ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".

". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

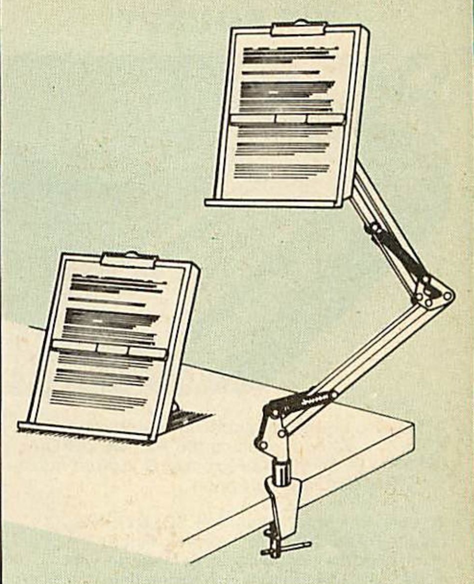
Compatible with: View, Wordwise & Wordwise +.

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic ruler and a clip grip.

Mounting to a convenient flat surface, the two joint anglepoise Manuscript Holder allows the paper to be positioned at virtually any convenient angle whilst only taking up a fraction of the surface area that the paper being held does.

The smaller desk resting Manuscript Holder is useful for the more organised desk where the problem is simply holding the paper at the right angle.

Whatever desk arrangement you use, surely you deserve a Watford Manuscript Holder!

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** *(carr. £3)*

All prices in this advert are exclusive of VAT.

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24.**

DISASSEMBLER ROM

ONLY **£16**

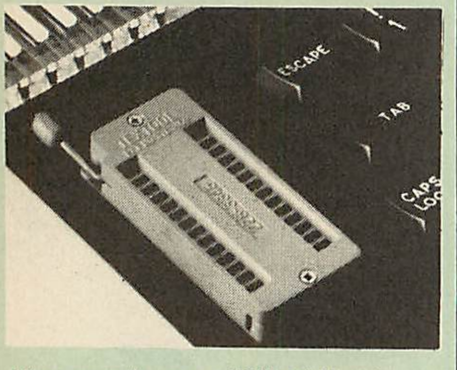
THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

Continued →

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

Complete System	**£12**
Spare Cartridges	**£2.50**
Spare Rack	**£1.50**

16K Sideways RAM Modules

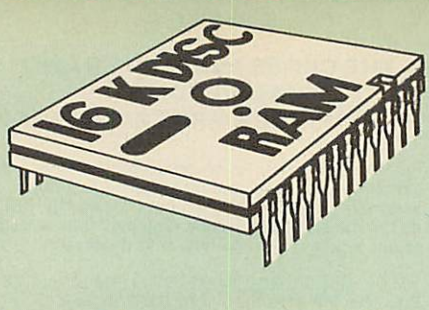
This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**



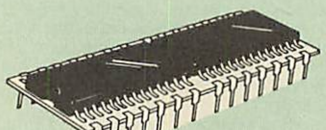
This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

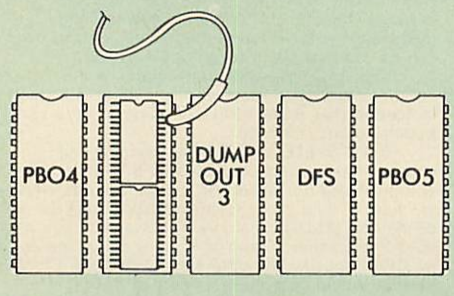
- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £30 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM





This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

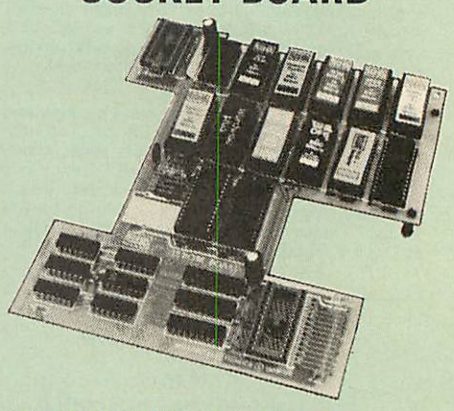
Only **£28** (carr 2)
Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the *best one* for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.
Do you require:

- Sideways RAM for a BBC B? Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc? Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16. Also permissable, are various configurations of RAM (up to 16k) and different sized EPROMs (see below).

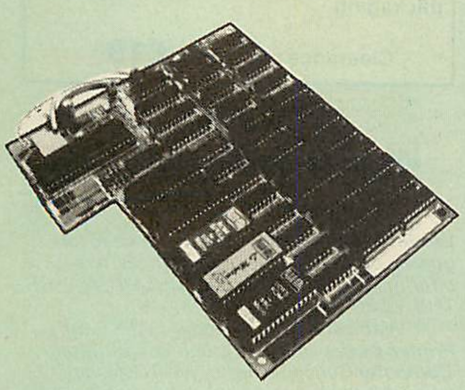
Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 can take the following chips: 2716, 2732, 2764, 27128, 6116, 6264.
- Read protect to make RAM "Vanish"; allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM/RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM/RAM Board.

The ROM/RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, should the user wish to upgrade in the future. Please write in for further details.

INTRODUCTORY PRICES:

- *ROM/RAM card with 32k dynamic RAM* **£43**
- *ROM/RAM card with 64k dynamic RAM* **£59**
- *ROM/RAM card with a massive 128k dynamic RAM* **£89**

(carriage on ROM/RAM Card £3)

OPTIONAL EXTRAS:

- *16k plug-in Static RAM kit* **£6**
- *Battery backup* **£3**
- *Read and Write protect switches* .... **£2 each**

Complete ROM/RAM board (all options installed) **£99**

- *16k Dynamic RAM for Upgrade* **£7.50**

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- *FREE 3 months subscription to MicroLink.*

- *BT Approval applied for.*

Price: **£89** (carr £3)

PROHIBITED from direct or indirect connection to any telecommunication system run by British Telecommunications. Action may be taken against anyone so connecting this apparatus

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£99 (carr £3)

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £87**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial/Auto Answer Board (non BABT)	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

APOLLO

The NEW Modem from Wtford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost – High Performance modem with Auto Dial & Auto Answer facilities as standard; we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200/1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75**
(Carr £3)
(Write in for full specification)

BT TELEPHONE CONNECTORS

LJU	1/4A Mini Line Master	**£4.50**
LJU	1/6A Mini Line Slave	**£3.00**
LJU	2/4A Line Master	**£4.00**
LJU	2/6A Line Slave	**£2.50**
LJU	3/4A Flush Master	**£3.95**
LJU	3/6A Flush Slave	**£2.75**
LJU	10/3A Dual Splitter	**£5.50**
	4 Way BT Plug	**£0.75**

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£27
Graphics ROM	£23
Disc Doctor ROM	£24
TERMI	£27
COMMUNICATOR	£49
SPEECH ROM	£26
Printmaster	£24

Wordwise £25

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text/segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET £40

INTER CHART ONLY: £26

Inter-WORD

Only: £46

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

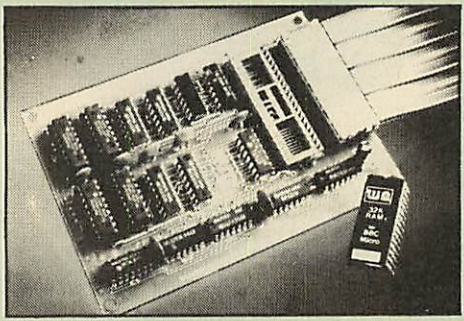
Only: **£39**

All Prices Exclusive of VAT

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B+ or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!

- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only: £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

SPECIAL OFFER

Acorn's Speech Synthesiser Package

Complete with manual in its original packaging

Clearance price Only: **£19**

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computer Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £75 (carr £2)

DATAGEM

Gemini's popular Database package

Only: £34

VIEW

VIEW WORDPROCESSOR 2.1 .... **£37**

VIEW 3.0 ROM

Price: Only **£56**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£36

VIEWSHEET (Acornsoft)	£37
VIEWSTORE	£37
VIEWSPELL	£29
VIEWPLOT Disc	£22
VIEW-INDEX	£14

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

Only: £10

ARIES CORNER

Aries Computers was the first company to commercially market what is now known as SHADOW RAM. As part of it's continued expansion policy, Watford Electronics is proud to announce that the Aries range is now available exclusively from Watford Electronics and their dealers.

The Aries range, designed by experts offers you the solution to your upgrade nightmares. All the Aries products are compatible with double density disc controllers, modems, second processors, ECONET, hard discs, EPROM programmers and of course, other members of the Aries family and most of the much wider Watford family (some products advertised here perform identical functions and hence cannot be used together). Several major companies now test all their products to ensure compatibility with the Aries B20 & B32.

In quality of construction, the Aries range sits alongside the Watford range in setting a standard against which others are judged. Custom made connectors eliminate the damage to the BBC machine caused by inferior products.

Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20; the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many othr applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 – BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 – BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234/33383

النور

ARABIC ROM
for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

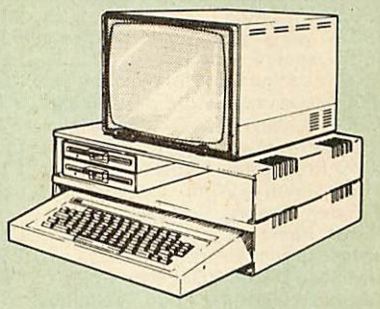
20, 40 and 80 column operation. Compatible with ASMO (449). English/Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

OFFICE MATE

The popular Database, Spreadsheet, Beebplot and Wordprocessor on Disc
£10

OFFICE MASTER

The popular Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements and Stock Control
£21

Money Management

This disc based software allows individual transactions to be stored and retrieved for upto 5 Bank a/c and 5 Loan accounts.

Price: Only **£11**

L.B.O. Rom
Life & Business Organiser

Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are ever likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!

Price only: £17

D D D Suite
Integrated Software System

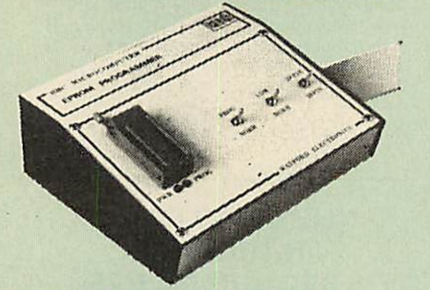
-BASE **£12**
-CALC **£12**
-PLOT **£12**
COMBO PACK All 3 together **£26**

Continued →

BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro) £7.95
40 Best machine Code Routines £7.95
6502 Assembly Language Program £19.95
6502 Application £11.95
6502 Assembly Lang. Subroutines ... £19.95
6502 Development System £7.50
6502 Machine Code for Humans £7.95
68000 Assembly Lang. Programming .. £19.95
68000 Machine Code Programming £13.00
68000 Programming the £22.95
6809, Programming the £16.95
A User Guide to Wordwise Plus £9.95
A Young persons Guide to BBC Basic £5.95
Advanced Disc User Guide £14.95
Advanced BASIC ROM User Guide £9.95
Advanced Machine Code Technique for BBC £7.95
Advanced Programming for BBC £6.95
Advanced User Guide for BBC £13.50
Advanced Graphics with BBC £9.95
Assembly Language Programming on BBC Micro £11.50
Advanced Programming Techniques for the BBC Micro £8.95
Adventure into BBC BASIC £6.95
Applied Assembly Lang. for BBC £9.95
Assembler Routines for the 6502 .... £7.95
Assembly Language Programming FOR the BBC Micro £9.95
Assembly Language Programming on the BBC & Electron £8.95
Basic Programming on the BBC Micro £6.95
Basic ROM User Guide £11.95
Basic User Guide for BBC Micro £10.00
BBC B+ User Guide £14.95
BBC BASIC £5.95
BBC Forth £7.50
BBC Hardware Projects £8.95
BBC Machine Code Portfolio £7.95
BBC MAster 128 High Flyer £10.95
BBC Micro Advanced Ref. Guide £10.95
BBC Micro Advanced Programming £10.00
BBC Micro Book BASIC Sound & Graphics £7.95
BBC Micro ROM Book £9.95
BBC Micro Disc Companion £8.95
BBC User Guide £10.00
BCPL User Guide £14
Complete FORTH £6.95
CP/M - 86 User's Guide £19.95
CP/M Bible £16.50
CP/M Handbook with MPM £9.95
CP/M Plus Handbook £13.95
CP/M Soul of £16.50
CP/M The software BUS £8.95
Creative Animation & Graphics £7.95
Creative graphics on BBC Micro £7.50
Disc Drive Projects for Micros £5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC £6.95
Disc Programming Techniques £9.95
Discovering BBC Micro Machine Code £6.95
Disc System for the BBC Micro £6.95
Exploring FORTH £6.95
FORTH on the BBC Micro £7.50
Functional Forth for the BBC Micro £5.95
Games BBC Micro Play £6.95
Graphs & Charts on BBC Micro £7.50
Hackers Handbook £4.95
Hackers Handbook - New £6.95
Handbook of Procedure & Functions for the BBC Micro £6.95
Interfacing & Robotics on BBC £15.95
Interfacing Your BBC Micro £8.95
Into View £4.50
Introduction to COMAL £9.50
Introduction to LOGO £6.95
Introducing 'C' £9.95
Introducing CP/M on the BBC Micro Z80 2nd Processor £9.95
Introducing LOGO £5.95
Introduction to FORTH £8.95
Introduction to PASCAL £17.95
ISO -PASCAL Reference Manual £9.95
Let your BBC teach u to program £5.45
LISP 2nd Edition £14.95
LISP, A Beginners Guide to £10.95
LISP the Language of Artificial Intelligence £9.95
Logo Programming £9.95
Mysteries of DISC DRIVES and DFS REVEALED **£5.95**
Mastering CP/M £17.95
Mastering the Disc Drive £7.95
Master Advance Reference Manual .. £19.95
Master Reference Manual Part 1 ...... £14.95
Master Reference Manual Part 2 ...... £14.95
Micronet Handbook £6.95
Programming the 6502 .... £16.95
Programming the Z80 .... £19.95
Sensing & Control Projects for BBC £5.95
S-PASCAL on BBC Micro £7.50
Structured Basic £7.95
Structured Prog. with BBC BASIC £6.50
Termulator Manual £4.95
The Complete FORTH £6.95
The Complete Programmer £5.95
The Epson FX/KAGA PRINTER Commands REVEALED **£5.95**
Turtle Graphics on BBC Micro £7.50
Using Floppy Discs with BBC Micro £5.95
View 3.0 User Guide £10
View Guide £4.50
Viewsheet User Guide £10
Viewstore User Guide £10
Using BBC Basic £4.95
Wordprocessing BBC Beginners Guide ... £7.95
Wordstar & CP/M made easy £7.45
Wordwise Plus Guide £9.95
Z80 Applications £15.95
Z80 Assembly Language Programming £19.95
Z80 Reference Guide £9.95

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

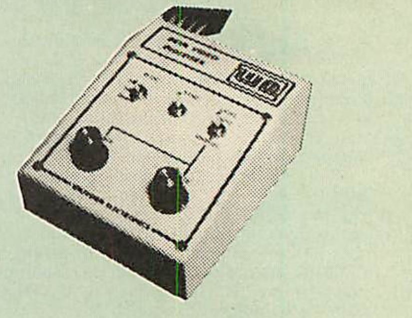
SPECIAL OFFER £69 (£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

BEEB VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£110 (Carr. £3)

(Price includes: Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£129.00** (carr. £3)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£16
Delta 14B Single Joystick	£12
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc/Tape	£7

ROM EXTRACTION TOOL

This extremely useful tool allows you trouble free chip removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

Price: **£2**

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources which put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only **£6.99**

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£13** (£2 carr.)

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL HEADER PLUG

SOLDER type	£1.50
IDC CRIMP type	£1.95

SPARES for BBC Micro

Keyboard	£46	Keystrip	£2
UHF Modulator	£4	Case	£25
Speaker Grill	£1	Speaker	£2
Power Supply	£59	Keyswitch	£1.50

Replacement FLEXIBLE KEYBOARD CONNECTOR

£3

8way DIP SWITCH **£0.85**

CONNECTING LEADS

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug	
to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	£2.50

DISC DRIVE POWER LEADS
Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

DISC DRIVE INTERFACE LEADS
BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	80p	200p
BBC Power Plug 6 way	80p	–
Disc Drive Plug 4 way	75p	–
6 way Power Connector	80p	95p

Watford Electronics' Dealer's List

UNITED KINGDOM

AKHTER INSTRUMENTS LTD, Akhter House, Perry Road, HARLOW, Essex

Beebug Retail, Dolphin Place, Holywell Hill, St. Albans.

Cirkit Distribution Ltd, Park Lane, Broxbourne, Herts.

C.J.E. Micros, 78 Brighton Road, Worthing, West Sussex. Tel: 0903 213361.

Gemini Marketing Ltd, Exmouth, Devon

HCCS, 575/583 Durham Road, Low Fell, Gateshead, Nr. Newcastle Upon Tyne. Tel. 091 4870760.

Mancomp Ltd, Printworks Lane, Levenshulme, Manchester. Tel: 061-224 1888/9888.

Microman Computers, Rainford Industrial Estate, Mill Lane, Rainford, St. Helens

Peartree Computers Ltd, St. Georges Street, Huntingdon Cambs.

Verospeed Ltd, Boyatt Wood, Eastleigh, Hants.

OVERSEAS DEALERS

Absolute Electronics, Rewal House, 208-210 La Trobe Street, Melbourne, 3000, Victoria, Australia. Tel: (03) 663 2411.

Alpha Computer Co, Shop 314 Chi Fu Commercial Centre, Chi Fu Fa Yuen, Hong Kong. Tel: 5-506592.

Computer Distribution Company, Parklaan, 47, B09300 Aalst, Belgium.

Lendac Data Systems, Unit 31, IDA Enterprise Centre, Pearce Street, Dublin 12. Tel: 710796.

Scientex P.V.B.S., Zilversmidstraat 2, B-2000 Antwerpen, Belgium, Tel: 03 233 59 06

Techno-matic Data, Holbergsgade 19, 1057 Kobenhavn K, Denmark

Velobyte, Scheaedyksadyk 5a-6a, 3011 EB Rotterdam, Holland, Tel: (010) 413 8197/414 5171.

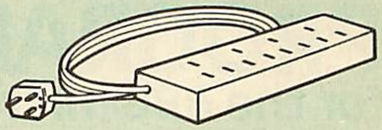
Viking Tecno, Vestergade 12.1, 9620 Aalestrup, Denmark, Tel: 08 642522

Viglen Console Unit

Enhance the appearance and convenience of your BBC Micro with the Viglen console unit.

£42 (carr. £4)

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug. **£9.50** (carr £1.50)

ACORN MUSIC 500

BBC B, B+ & Master Compatible.

(We have inspected a Music 5000 unit and to our surprise we found it to be the same as Music 500 unit. Only the front panel and the software are different. Can anyone help us to solve the mystery?)

£72 *(carr £4)*

Software Disc 'Mu-500' has 13 tunes **Only: £6**

CHIP SHOP

8271	£36
DS3691	£3.50
DS88LS120	£5.25
LM324	£0.45
SN76489	£5.50
SAA5050	£8.75
UPD7002	£4.40
2764-250nS	£2.00
27128-250nS	£2.50
27512	£18
4013	60p
4020	£0.90
4464	£8
4816 RAM	£1.75
6264LP-8K RAM	£3.00
6502A CPU	£5
65C02 CMOS	£10.00
65C12	£9
6512A	£10.00
6522	£3.40
6522A	£5.00
6845SP	£6.00
7438	40p
74LS00	25p
74LS04	25p
74LS10	25p
74LS123	80p
74LS163	70p
74LS244	80p
74LS245	£1.00
74LS373	£1.00
74LS393	£1.00
75453	70p

ASSORTED ROMS

ACORN BASIC 2	£19
ACORN ADFS	£25
ACORN DNFS	£17
Acorn OS 1.2	£6
Acorn OS B+	£25
Acorn BCPL	£42
BCPL Calc Pack	£15
BCPL Stand Alone Generator	£36
Basic Editor	£25
BROM	£28
Buffer & Backup	£20
Beebmon	£22
Beebfont	£25
Acorn COMAL	£36
Acorn FORTH	£32
Acorn Graphics	£25
Graphics Extension Rom	
GXR-B	£21
GXR-B+	£22
Acorn LISP	£35
Acorn LOGO	£42
ISO Pascal	£42
ISO-Pascal Stand Alone Generator	£30
ICON Master	£28
Logotron LOGO	£52
Micro Prolog	£62
Microtext ROM	£48
ROMIT	£29
Serial ULA	£13
Video ULA	£15
TERMULATOR	£25
MUROM	£21
SLEUTH ROM	£24
STUDIO 8 Disc	£18
Toolkit Plus	£31
Communicator	£49
Disassembler	£16
Help II	£27
Mini Office II	£14.50
View 2.1	£37
View 3.0	£56
Hi-View	£36
Viewsheet	£37
Viewstore	£37
Viewspell	£29
Viewplot Disc	£25
Datagem (Gemini)	£34

Prices subject to change without notice and available on request. ALL OFFERS subject to availibility.

Mail Order and RETAIL SHOP. Trade and Export inquiries welcome.

Government and Educational Establishments' OFFICIAL ORDERS Accepted.

Shop Hours: 9.00am to 6.00pm. Monday to Saturday. Thursdays 9am to 8pm. (Free Customer's Car Park)

VAT: UK customers please add 15% VAT to cost incl. Carriage.

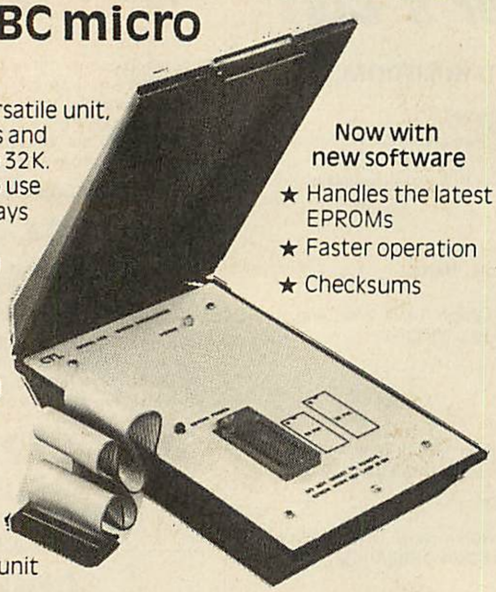
CARRIAGE: Unless stated otherwise, minimum £1 on all orders. £2 on Larger items. On bulkier items, £7 Securicor charge applies. Overseas orders, carriage is charged at cost.

Specifications of all products are given in good faith but is subject to change without notice. Some items vary in their availability. Please ring for latest delivery situation.

Watford Electronics

JESSA HOUSE, 250, Lower High Street, WATFORD, ENGLAND
Telephone: (0923) 37774; Telex: 8956095; FAX: 01 950 8989

EPROM PROGRAMMER
for the BBC micro



An exceptionally versatile unit, programs EEPROMs and EPROMs from 2K to 32K.
Powerful, easy to use software in a sideways ROM.
Features full screen data editor, files, and softkeys.
Professionally designed hardware ensures reliable and safe programming, also detects badly socketed EPROMs.
Soundly constructed in a convenient flip-top box which protects unit when not in use.
Supplied with a comprehensive manual.
Adaptors for single chip EPROM MPU's available.

Now with new software
- ★ Handles the latest EPROMs
- ★ Faster operation
- ★ Checksums

£95 (excl VAT, free P&P)
10% Educational discount available
2 year guarantee. Detailed information on request

CTL
Control Telemetry of London
Unit 11, Burmarsh, Marsden St.,
London NW5 3JA Tel: 01-482 2177

POOLSWINNER
THE ULTIMATE POOLS PREDICTION PROGRAM



Boxed, with detailed instruction booklet

- **MASSIVE DATABASE** Poolswinner is a sophisticated Pools prediction aid. It comes complete with the largest database available – 22000 matches over 10 years. The database updates automatically as results come in.
- **PREDICTS** Not just SCOREDRAWS, but AWAYS, HOMES and NO SCORES.
- **SUCCESSFUL** SELEC guarantee that Poolswinner performs significantly better than chance.
- **ADAPTABLE** Probabilities are given on every fixture – choose as many selections as you need for your bet. The precise prediction formula can be set by the user – you can develop and test your own unique method.
- **SIMPLE DATA ENTRY** All team names are in the program. Simply type in the reference numbers from the screen. Or use FIXGEN to produce fixture list automatically (see below).
- **DISC/MICRODRIVE COMPATIBLE** Tapes supplied with conversion instructions.
- **PRINTER SUPPORT** Full hard copy printout of data if you have a printer.

PRICE £15.00 (all inclusive)

NOW AVAILABLE

FIXGEN 86/7
AT LAST: No more struggling for hours to get the fixture list into the computer. FIXGEN has been programmed with all English and Scottish fixtures for 1986/7. Simply type in the date, and the full fixture list is generated in seconds. Fully compatible with Poolswinner. Yearly updates available.
POOLSWINNER with FIXGEN £16.50 (for both)

COURSEWINNER V3
THE PUNTERS COMPUTER PROGRAM



NOT JUST A TIPSTER PROGRAM, Coursewinner V3 can be used by experts and occasional punters alike. You can develop and test your own unique winning system by adjusting the analysis formula, or use the program in simple mode. Coursewinner V3 uses statistical analysis of major factors including past form, speed ratings, course statistics, prize money, weight, going, trainer and jockey form etc, etc. It outputs most likely winners, good long odds bets, forecasts, tricasts etc. The database includes vital course statistics for all British courses. You can update the database – never goes out of date.

PRICE £15.00 (all inclusive) includes Flat AND National Hunt versions.

ALL PROGRAMS AVAILABLE FOR: AMSTRAD CPCs, AMSTRAD PCWs (ADD £3.00), All BBCs, All SPECTRUMS, COMMODORE 64/128, ATARI (48K+), SINCLAIR QL.
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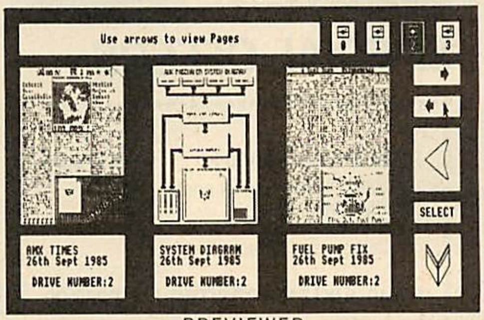
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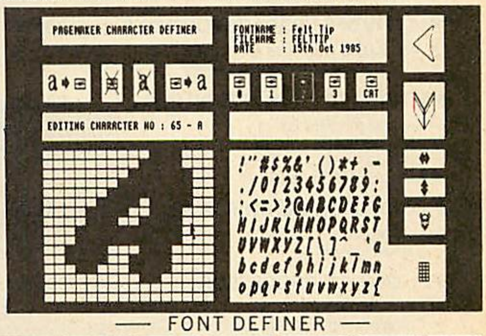
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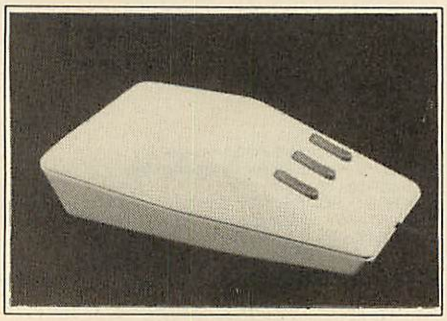
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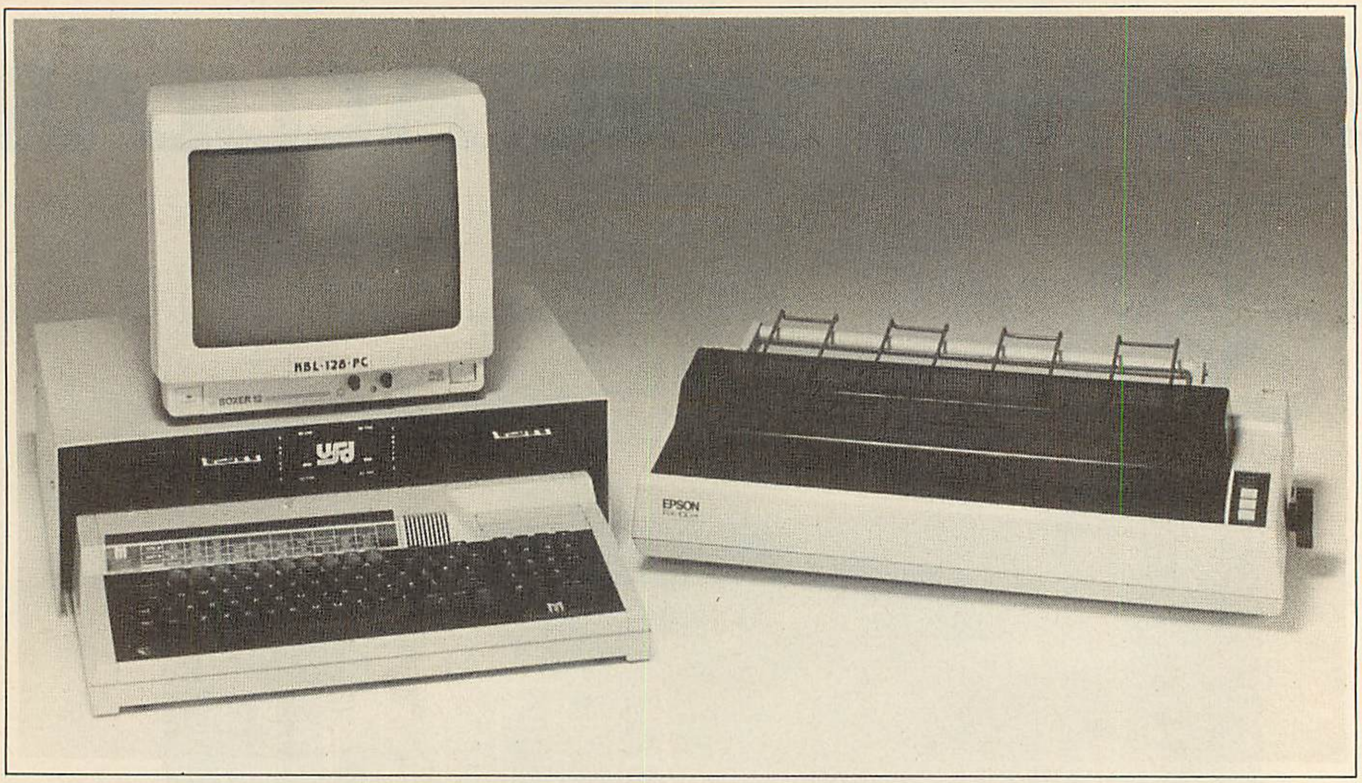
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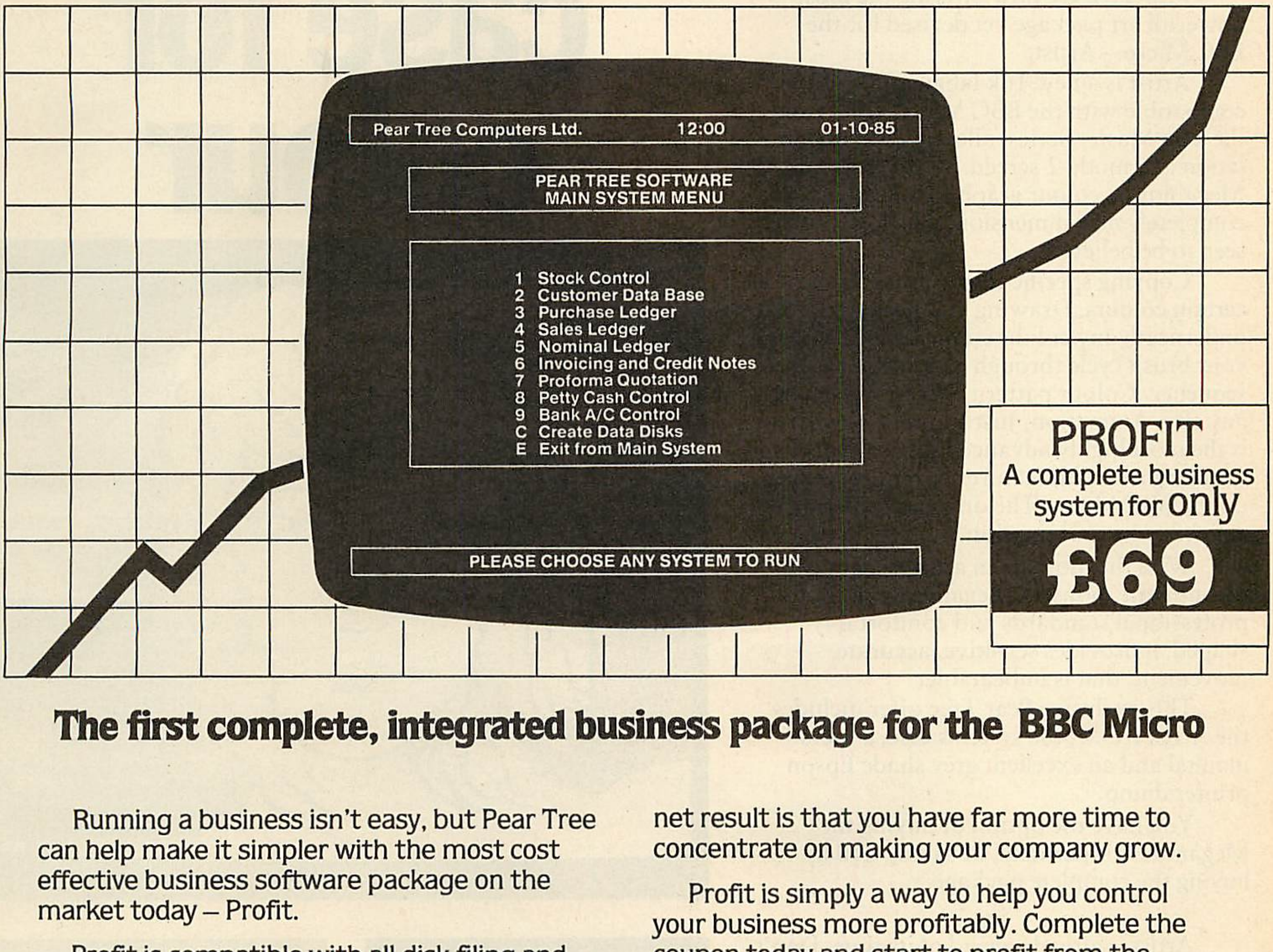
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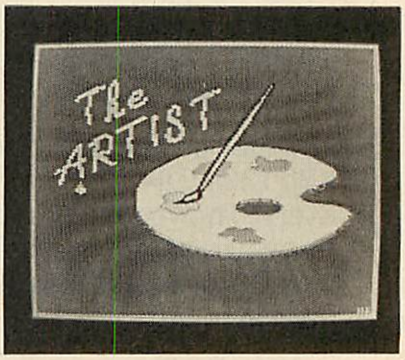
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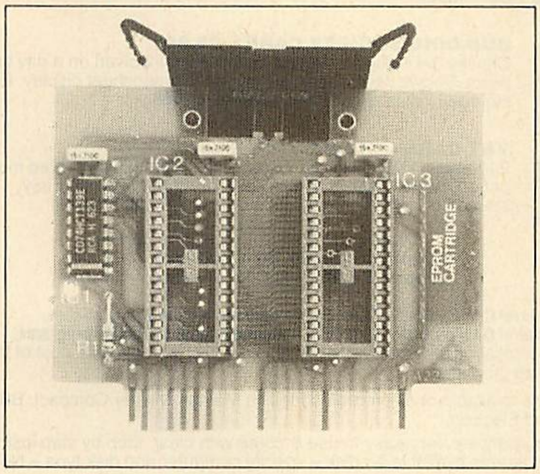


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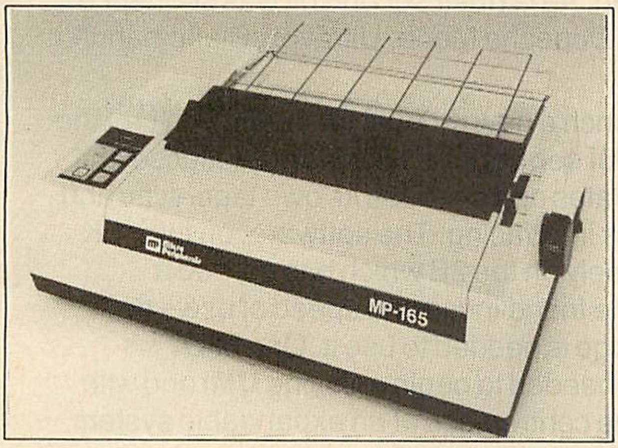
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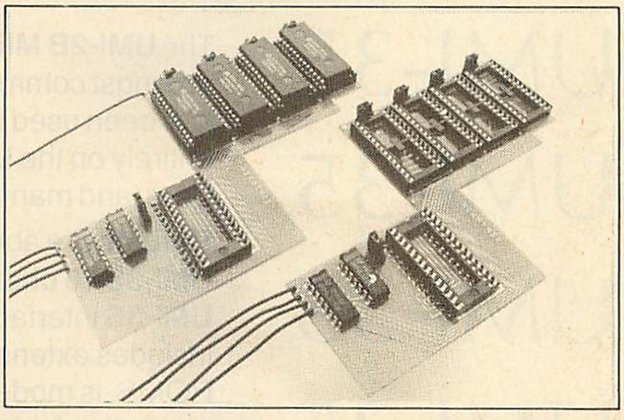
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JOE'S A COOL CALCULATOR



Our Joe explains what WIMPS are and uses them to create an on-screen desk-top calculator to play word games on

Joe Telford

One of the most well known graphics environments used to support dialogue between human and computer is the Gem package from Digital Research. Gem has become the front-end for the new Acorn Master 512 mini-versions of this type of human machine interface used for example in the AMX mouse and its associated software.

I'll examine how this type of environment works and present an on-screen calculator to demonstrate the principles.

Our yellow page listing will run with a number of mouse packages, but will also run by itself for the mouse-less.

What are WIMPS?

The expression WIMP is an acronym for Windows, Icons, Mice, Pointers.

A window is a rectangular area of the screen which contains information. Information can be entered two ways; by typing into the window or by clicking on buttons visible on the window. There are three levels of complexity which you can see in figures 1 a, b and c. The first displays static windows on a blank background. The next level displays moveable windows and the third, windows which overlap.

An icon is a small picture relating to a process (see figure 2). On clicking on an icon, something obvious should happen. A button is an icon which resembles that of a physical keyboard. Buttons live inside windows and activate specific tasks. Our application makes use of both icons and buttons. Figure 3 illustrates a typical button. Again there are three levels of sophistication with icons:

- Icons which remain in view for the entire application.
- Icons/buttons which appear depending

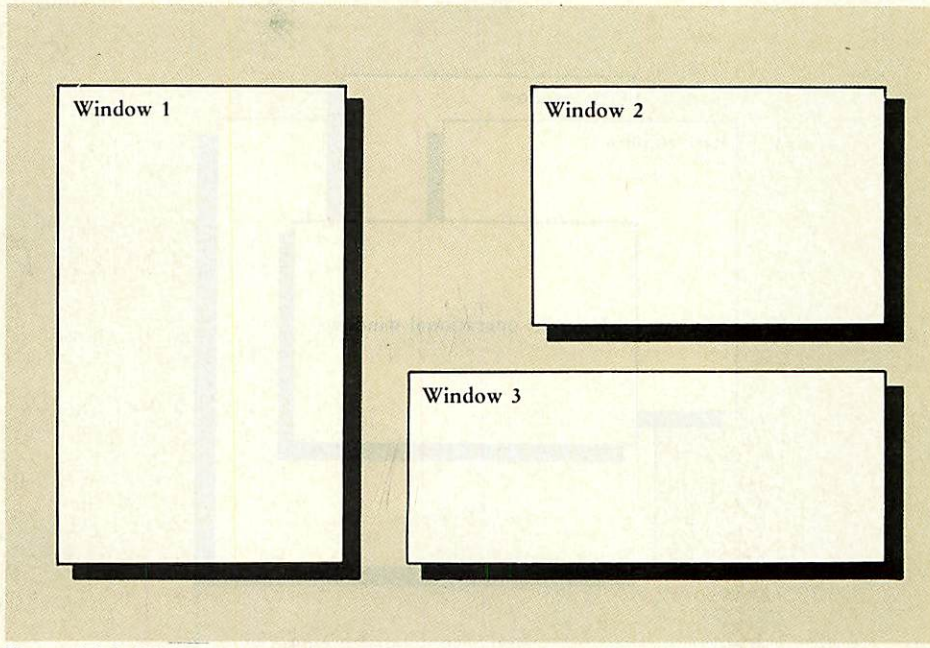


Figure 1 (a). Windows are static on a blank background

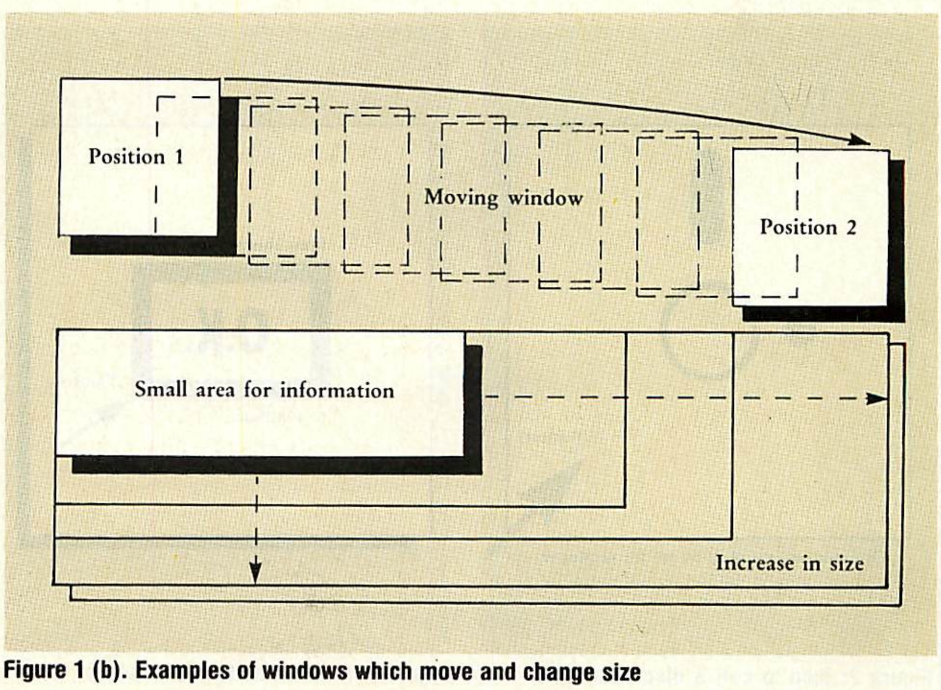


Figure 1 (b). Examples of windows which move and change size

on the current window.
- Moveable icons.

In our demonstration program we work with the second level.

A mouse is a piece of hardware generating pulses when moved. Mice are supplied with software which turns pulses into cursor key movements. Mice have one to three switches on their backs, the AMX breed typically having three. Our application only uses cursor keys plus Return. However, readers with a mouse and ROM software should be able to use the program presented with either keyboard input or mouse, although slight amendments may be necessary for efficient operation.

The pointer is a small arrow-like icon indicating on the screen where the input action is to be focused. Our pointer can be used by moving the cursor-keys. Figure 4 shows the character grid and the FCU commands used to generate the pointer.

Clickety-click

The term 'clicking' on refers to moving the pointer to an icon or button and pressing a switch on the back of a mouse. In our application this is achieved by moving the pointer with the cursor keys and pressing the Return key.

The application which we have chosen is a calculator with a standard 24-key keypad. Almost everyone has experience of such a device, and it will introduce us to the concepts involved in programming WIMP environments. To start, type in the yellow page listings and save them as 'CALC'. Whenever you CHAIN 'CALC' the calculator will start up.

You can see the desktop on start-up on page 85. Notice that there are two areas which have icons/buttons. The heading strip has three icons; an acorn, a bell, and a square enclosing the number 4.

The other area is the calculator itself and this has 24 button icons, any of which can be pressed with the pointer.

The pointer can be moved by pressing any cursor key until the pointer goes in the correct direction. Two cursor keys can be held down to make the pointer move diagonally. When positioned on the desired button or icon, pressing Return clicks-on that icon and activates its associated task.

The three icons at the top of the screen perform the following functions. The acorn reveals the copyright message. This message stays on screen until its OK button is pressed. Until this happens all the other icons are deactivated.

The bell toggles the button-sound on and off. The first click-on turns the bell off. The next click-on turns the bell on.

The square informs that you are on a mode 4 screen. Clicking on this will restart the program with a mode 1 screen and a coloured calculator. The icon will change to a square enclosing a figure 1. A second click will switch back to mode 1, and the mode will toggle on each click. If your computer cannot support mode 1 because of lack of memory (you need a B+ or a Master or some other form of sideways RAM screen) then the calculator display will indicate 'not enough room' and you must press a calculator key to continue.

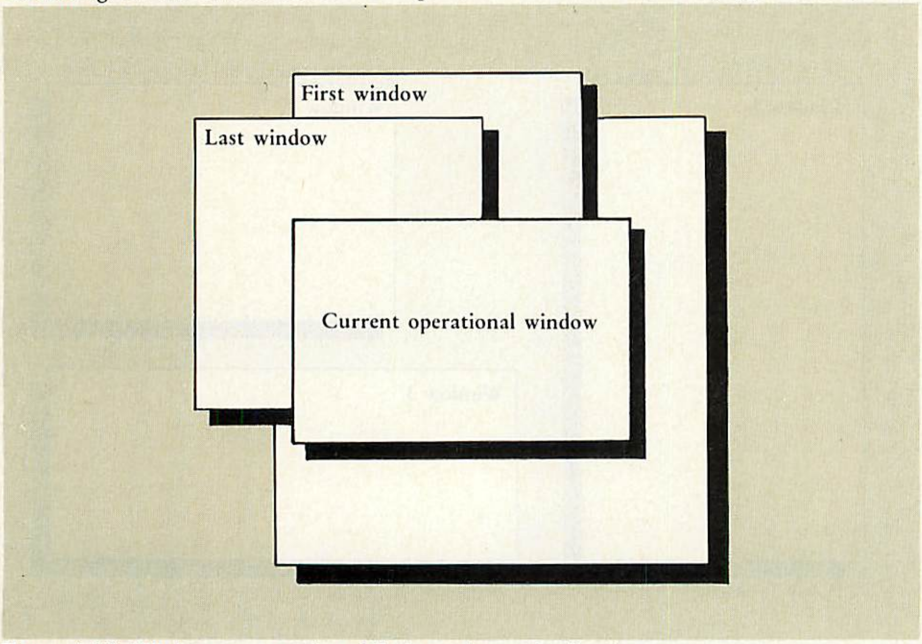


Figure 1 (c). Windows can overlap at their most complex level

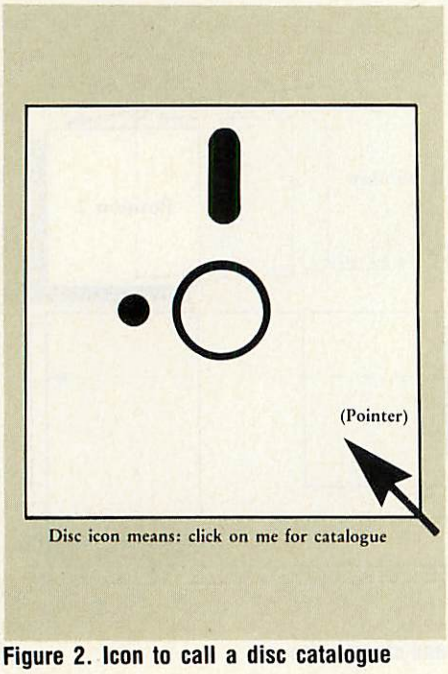


Figure 2. Icon to call a disc catalogue

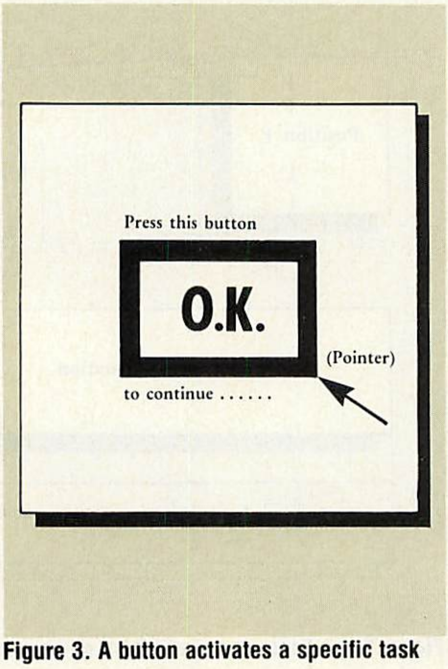


Figure 3. A button activates a specific task

The calculator

The calculator as shown on page 86 has the following specifications:

- 9 digit keys
- Decimal point key
- Binary operator keys
- Operator termination key
- Unary operator key
- Store, recall and clear memory keys
- Clear current input line key
- Clear operation and input key
- Power off key (back to Basic)
- Intelligent percentage key
- Range of display
- Indicator for memory contents not zero
- 13 character (plus unary minus) input facility
- Digital LED simulated readout

To enter any number simply click on the calculator buttons in turn, moving between

the buttons with the cursor keys, thus 3.14159 can be entered as it stands. Entry is automatically terminated when an operator key (=) is pressed. So to work out the area of the Telford Towers courtyard, we would click on:

10.4 × 25 =

and the calculator will respond:

Click on	Display
1	1
0	10
.	10.
4	10.4
×	10.4
2	2
5	25
=	260 (ANSWER)

The same approach works with all the simple operators. Notice however that the division sign is the traditional sign rather than the / which we use in this text. Also note that division by zero produces an error. Click on any button to clear this error messsage. Current calculations up to that point are lost. Extended calculations can be performed by stacking up operators. For example the number of seconds in a year can be calculated by clicking on each button in the sequence:

60 × 60 × 24 × 365.25 =

which brings us to the knotty problem of precedence of operators.

Basic performs arithmetic operations in a certain order, giving some functions precedence over others. Our calculator has no bracket facilities and therefore has no way of giving precedence to any operator. The result of this is as follows.

BBC micro calculation:

3 + 4 * 8 – 15 / 3 = 30

On a calculator:

3 + 4 × 8 – 15 / 3 = 13.67

in other words each pair of numbers is operated on, then that answer goes on to be a number in the next operation, eg:

Action	Interpretation	Answer
3 +	3	3
4 ×	3 + 4	7
8 –	7 × 8	56
15 /	56 – 15	41
3 =	41 / 3	13.6

The key marked +– can be used at any point to change the sign of the number being currently entered. It must be clicked on before equals is pressed. For example, we have just calculated the answer to 25 × 25 and we want to subtract the answer from 1000. The action would be:

24 × 25 = +– + 1000 =

by adding 1000 to –625 we achieve the same result as 1000 – 625. This plus-minus key is useful in performing short cuts, but has a more normal role in handling negative numbers. We wish to perform the sum 5 × –4, this is calculated as follows:

5 × +– 4 =

and the answer –20 should appear.

Clearing up

The CL key deletes the currently entered number. We have entered 25 × 41 but wanted 25 × 40. Providing that the = sign or any other operator (other than +–) has not been pressed, the 41 can be deleted by pressing CL and the 40 then entered. If the whole calculation is incorrectly entered or a clean start is required, click-on the CA key to remove the current input line and the calculation so far. To leave the calculator just click on the OF key, and the computer will return to Basic. The calculator can be restored with OLD then RUN.

Memory Lane

The calculator has three memory keys. CM (clear memory), RM (recall memory) and SM (store memory). CM can be clicked at any time and works separately to CA. When RM is clicked, the contents of memory are transferred to the calculator display replacing the current input line.

For example memory contains 3.142 and we wish to discover the circle of radius 1.5m, enter:

1.5 × 1.5 × RM =

Once a number is entered, it can be transferred to the memory, using SM (store memory). An indicator above the CM key shows that the memory is not zero. The indicator will vanish if CM is clicked or 0 SM is entered.

The percentage key handles five different percentage functions. Straight percentage conversion is carried out as follows:

CA 8 7 . 5 %

and the display will read 0.875. This number can be operated on as normal.

To calculate the percentage of a figure, for example what is 87.5 per cent of 50, key in:

CA 8 7 . 5 % × 5 0 =

to get an answer of 43.75. Notice that the word 'of' is replaced by the '×' sign. This can work in reverse:

CA 5 0 × 8 7 . 5 %

in which case the = sign isn't required, but

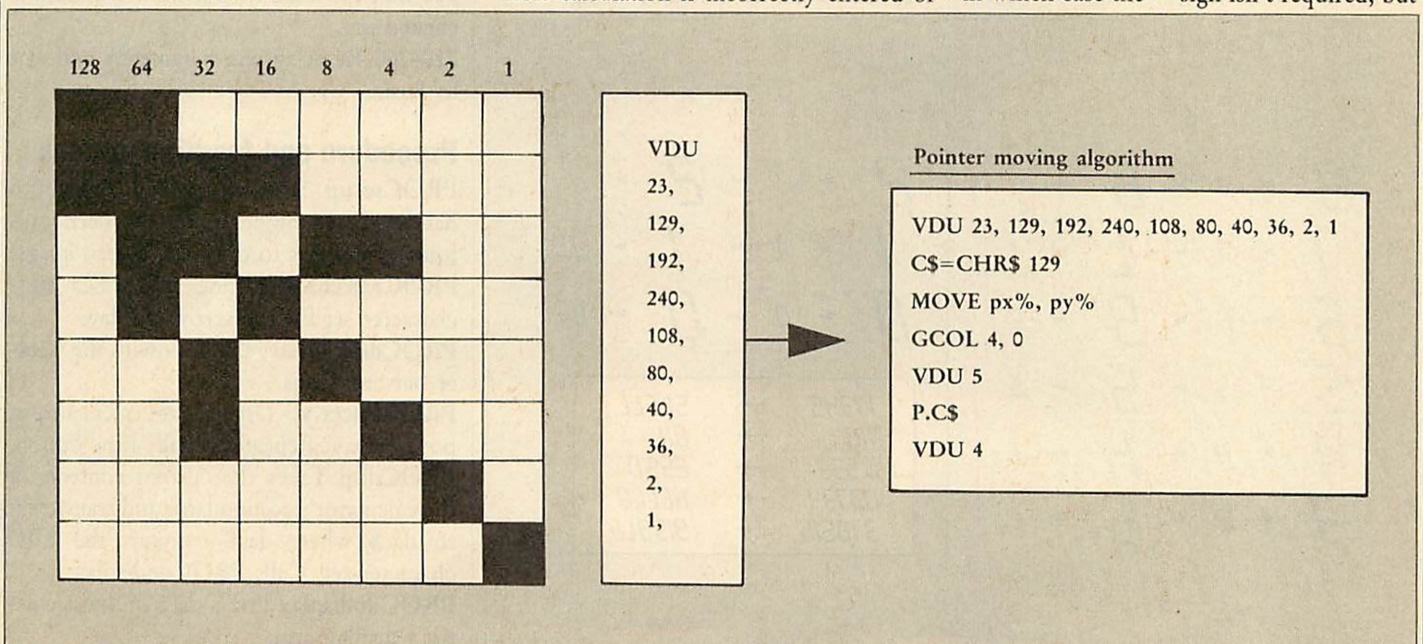


Figure 4. A typical mode 4 pointer, and the algorithm to display and move it

the decimal equivalent of 87.5 per cent is not shown.

A typical percentage problem might be: 'Bruce Smith gets a salary of £1850. This year Tony Quinn offers him a rise of 12.5 per cent. What is Brucie's new salary?' The solution is to key:

CA 1 8 5 0 + 1 2 . 5 %

This responds with £2072 (and isn't he worth every penny!). This key is also useful for creating profit margins. For example, Thickidisc has a sidewise ROM board which costs £12 to make. It requires a 180 per cent profit on all goods, so what should it charge? Again key in:

CA 1 2 + 1 8 0 %

to get the answer of £33.20.

Problems of this sort only ever occur on exam papers and at the Acorn User Show, but imagine this situation, a BBC micro normally costs £368 excluding VAT, what is the cost after being discounted by a further five per cent? Key in:

CA 3 6 8 – 5 %

to see the discount price of £349.60.

Fractions can be converted very easily to percentages. The typical example of this type of problem might be, 'What is 7/8 as a percentage?'. Key in:

CA 7 / 8 %

to get 87.5. Press per cent again to get the answer as a decimal.

Puzzle time

The design of the display character set looks like a calculator's LED display. This enables us to display some letters by imagining the numbers in the display upside down. Figure 5 shows the available character set and some typical words produced. All the words generated must only use the letters: b,L,g,S,h,E,Z,I,O and the decimal point can be used as an apostrophe. Physical calculators are easy to turn upside down, ours is more difficult. Users should remember that standing on your head should not be practised for long periods of time. The inset panel marked as figure 6 illustrates some calculator word puzzles to try. Answers are on the yellow pages.

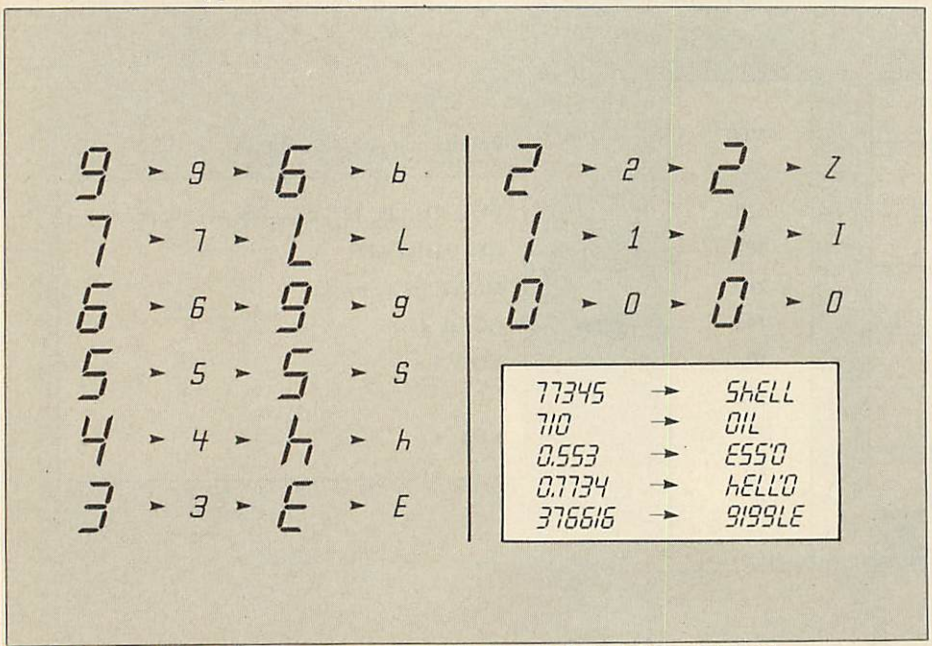


Figure 5. How LED numbers can be used upside down to form letters and words

Inside the program

The main body of the calculator program extends to line 270. It starts by setting up a number of important global variables, which relate to the rest of the program:

@%= &0100090A Default value for the program. The initial 01 activates the BBC micro's string conversion-format facility.

zone% Used to hold the default value of @% for later restoring.

cflag A variable which is set to 1 to indicate the copyright notice is on screen, and hence disables all other buttons.

cx & cy The x,y co-ordinates of the bottom left of the copyright notice.

vol Flag indicating the volume of sound (1 = ON) (0 = OFF).

vflag Similar flag indicating whether the volume is to change (1 = change volume) (0 = maintain volume).

dpflag Flag indicating whether a decimal point has been pressed. This avoids multiple dps in a number entry.

eqflag A 1 here indicates the last key clicked on was the = sign.

opflag A 1 here indicates that the last key clicked on was an operator.

mem$ Calculator memory string.

acc$ Calculator accumulator string.

op$ A string containing the first part of a calculation plus the operator (for example 3.124 ×).

sx & sy The x,y co-ordinates of the bottom left of the calculator 'window'.

px% & py% The x,y co-ordinates of the current pointer position.

off A boolean variable which returns TRUE only if the off button on the calculator is clicked.

Major program line functions

Between lines 80 and 240 the program lines have the following functions:

80 Calls PROCsetup to draw screen image, then selects inverse colour plotting. PROCsetup selects cursor key input, faster key repeat rate and quicker response-time to auto-repeat.

90 Protects against two user induced errors. Out of room and division by zero.

100 Start main program loop, set exit flag to False, then move the pointer until the Return key is pressed.

From this point the Return key is pressed and we are looking at the position of the pointer on screen:

150 If the pointer is on the mode icon change screen mode (unless we are in the process of handling the copyright task).

160 If the pointer is on the bell icon, toggle the sound flag from on to off or vice versa.

170 If the pointer is on the acorn icon display the copyright message, unless it is already displayed.

180 If the pointer is on the calculator keyboard, find which key has been clicked and act on it.

190 If copyright task is active, cancel it.

200 Exit the main loop if the Off button is clicked on.

210–260 Reset system parameters and exit to Basic.

Procedure and function actions

PROCsetup Sets the colour pallette to handle screen modes 1 and 4. Then calls four procedures to draw the screen image.

PROCcalcchars Defines the LED style character set for the screen display.

PROCdesk Draws the desk with the header bar and icons.

PROCcalc(x,y) Draws the calculator at position x,y. Repeatedly calls Proc button.

PROCdisp Takes the current contents of the calculator's accumulator and transfers it to dac$ where dac$ contains the LED character-set. Calls PROCdodisplay.

PROCdodisplay Prints dac$ in the calculator's display area.

PROCbutton(x$,s,y) Draws a rectangular

button starting at x,y and containing the two-letter string x$.

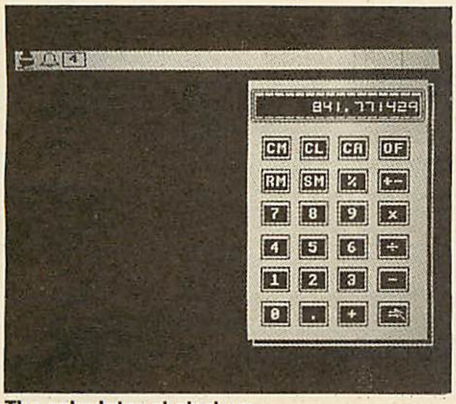
PROCmoveptr Interrogates the keyboard using INKEY(–x) for speed. Also allows double key presses to be acted on. Moves the pointer left, right, up and down or diagonally in two pixel units.

PROCvolume Designs the bell icon, selects which one to display and toggles the sound on/off flag if needed.

PROCcopyright(x,y) Draws the copyright window at x,y and sets cflag to one to prevent other button clicks.

PROCscrubcopy(x,y) Deletes the copyright window and resets cflag.

PROCdecode Uses a formula on line 620 to return a number relating to the button



The calculator at start-up

clicked on. If the button is not between zero and 23 then the procedure ends, otherwise the number returned is used to direct program execution to a procedure specific to that key.

PROCca Clear acc$ and op$.

PROCcl Clear acc$.

PROCcm Clear mem$.

PROCrm Transfer mem$ to acc$.

PROCsm Transfer acc$ to mem$.

PROCpercent Execute intelligent per cent.

PROCplusmin Change sign of contents of acc$.

PROCop(s$) Reset the flag dpflag, evaluate op$ and acc$, display result and transfer the result to op$, including the new operator.

PROCequals Reset dpflag, evaluate op$ and acc$, display and transfer the result to op$.

PROCenter(x$) Add x$ to the end of the current number string being input.

PROCerr Handle No Room and divide by zero errors.

PROCsetzone(x) Display up to nine decimal places before switching to exponential notation.

PROCi Illuminate button.

PROCrect Utility routine for drawing/ filling rectangles.

1. The Telford Towers Sales Rep has had her Wartburg Car for three years. She travels on average 107 miles each day, five days per week. She has a 47-week working year, and has covered an additional 1910 miles holiday motoring during the time that she has had this car. Can you calculate the number of miles travelled and hence find the type of oil used?
2. Tig the Pig is given a trough of 4500 acorns. 13 per cent are rotten, and a further 196 are too young to eat. What is the number of edible acorns in Tig's trough, and what befell poor Tig?
3. An American tourist went into an English bank to change $20 at the 1.25 rate. After conversion the bank's commission was 12.5 per cent. How many pounds did the tourist get, and what did he say when he met the bank clerk?
4. Take the number of bits in a byte, times by five, add 20 and multiply by 50. Divide this answer by three, add 504 and times by five again. When you add 1489 your answer will be correct only if you have made a mistake!
5. A pop group sold tickets at a number of tour venues. In total 2000 seats at £4.50 were sold, 3000 at £3.75 and 2214 standing places at £1. The total sum was divided between the promoter and the group members in the ratio one to three. If there were three in the group, what did each get? And what did they call their venues?
6. What number must be added to a single bird to make a flock?
7. Geordie went into a bar and downed 22 shorts, 16 pints of bitter and 18 malts. He finished up with seven glasses of liqueur, walked out of the pub and assaulted a policeman. In considering his case, the judge added all the individual drinks together, and made their total of Geordie.
8. The same judge used the *Acorn User* calculator when he used it to check the amount of money stolen in a cat burglary. The jesting judge noticed that if the phone number of the police was added to the total, the statements of the defendant were plainly false! What was the sum stolen?
9 I think of a fish, multiply it by six, add 24, divide by two, subtract 41, and take a tenth of the answer to give a girl named after the Queen. What are my numbers?

Answers on the yellow pages.

Figure 6. Try these calculator word puzzles

Program alter action

The chances are that the program will run satisfactorily, and this can be improved by adding a !BOOT file to your disc:

```
*BUILD !BOOT
PAGE=&1200
CH."CALC"
ESCAPE
*OPT4,3
```

This guarantees use of mode 1 on the BBC B with disc interface. For micros with tape only, don't alter page (&E00). For B+ machines include, instead of PAGE= &1200, the command *SHADOW. Masters will normally not need any alteration to their !BOOT file which will read:

```
*BUILD !BOOT
CH."CALC"
ESCAPE
*OPT4,3
```

Mousey mousey

It should be possible to connect a mouse to the package and use it instead of the cursor keys. The mouse-ware should handle this transparently to the user. For an old AMX Mouse I made the following alterations to the boot file on a BBC B:

```
*BUILD !BOOT
0001 PAGE=&1200
0002 *MOUSE ON
0003 *MCURSOR ON
0004 *BUTTONS 0
0005 *SENSITIVITY 2
0006 CH."CALC"
ESCAPE
*OPT4,3
```

and internally:

```
DEFPROCmoveptr
LOCALm%
REPEAT:MOVE
px%,py%:m%=INKEY(5)
IF m%= 139 AND py%<1024
P.c$:py%=py%+8:MOVEpx%,py%:P.c$
IF m%= 138 AND py%>32
P.c$:py%=py%-8:MOVEpx%,py%: P.c$
IF m%= 137 AND py%<1250
P.c$:px%=px%+8:MOVEpx%,py%:P.c$
IF m% 136 AND py%<0
P.c$:px%=px%-8:MOVEpx%,py%: P.c$
MOVEpx%,py%:UNTIL m%=13
ENDPROC
```

and line 110 altered to:

```
REPEAT:off=FALSE:PROCmoveptr
```

Enjoy calculating! I'd be interested to hear from anyone who has done something novel with this tool, or who has altered it to better fit his or her needs.

See the index to yellow pages on page 113 for details of where to find Joe's listings and how to enter them.

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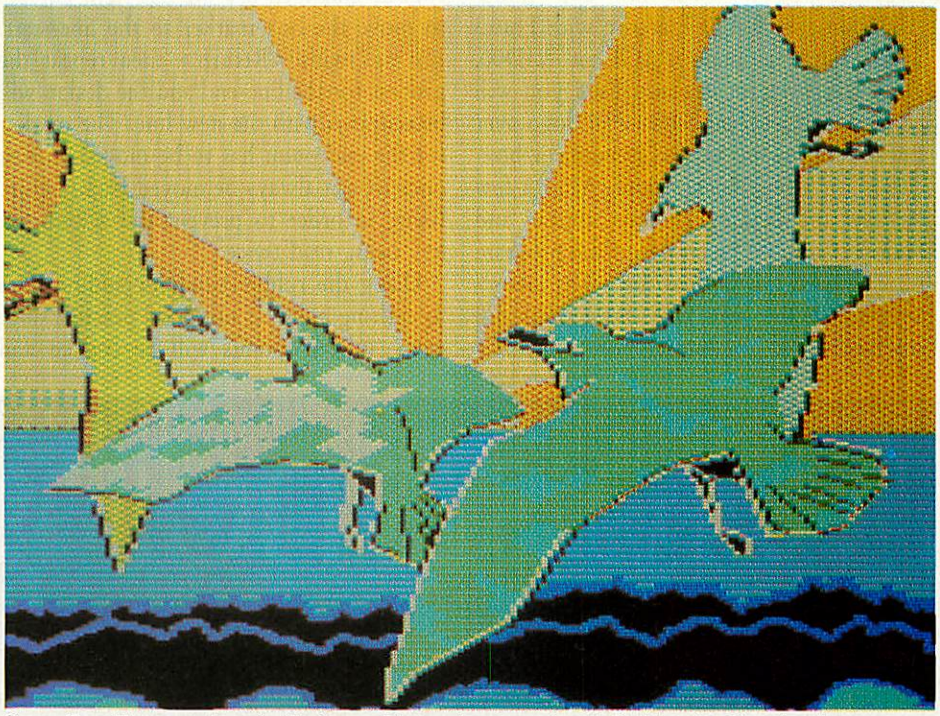
A NICE LINE IN PLOTTING

Type in our Super-Plot listings and you can draw three dimensional wire frame images on a plotter – and they can be edited for more creative fun

Jonathan Baldwin

The BBC model B, despite its venerable age, by home-computing standards, can still give a lot of recently introduced models a good run for their money. The graphics screens are particularly versatile and easy to use, a feature which, without doubt, owes a lot to their large memory commitment. Unfortunately the operating system also demands a share of the available RAM and as a result there can be precious little space for user-programs. In general programs which build up large blocks of stored information need to be run in modes 4 and 5, but of course this cuts out the advantages of using the colour palettes and higher resolution of modes 0 to 2. One way round this restriction would be to use mode 4, say, for program sections which produce files of information, then transfer to mode 1 to take advantage of the colour options.

Super-Plot is an example of a 'point-and-line' graphics editor running in mode 4. Any drawings which are produced with it are not only stored in the screen memory but also in other blocks of RAM. The information they contain is set out as lists of numbers, representing in this case the point co-ordinates and line types of the drawing. Such lists are usually referred to as 'files' and their contents, the numbers, are collectively called 'data'. The term 'data-file' is often used in this context. *Super-Plot* also contains editing-routines and it allows drawings at any stage to be manipulated at the press of a key – and with quite amazing speed! It was originally developed to meet the requirements of a school art department and as such it differs in certain respects to most CAD (computer aided design) programs; that is why numnumbers do not feature at all and, as far as



Seagull outlines produced with Super-Plot and coloured with Goldstar's *Sketchpad*

possible, all input is by direct visual means with an equally direct response on screen.

The program accepts information 'rubber-banded' from the keyboard and maintains it as a set of files starting at &1900. For storage purposes the files are converted to a compressed format and several can be edited together to form a composite picture – a feature which is particularly useful if you keep a collection of design 'primitives' in a library. Once a complete design has been assembled it can be converted to any graphics mode and saved, and may be used with painting programs which run in modes 0 to 2, such as Rob Fenton's painting program, *Freehand* or *Super-Painter*. A simple mode conversion program is presented with the Super-Plot listings in the yellow pages. The software was primarily designed to be used with plotters, and if you are lucky enough to be one of the growing number of people who have access to one you will be able to use it to create plotter-drawings. Plot-Mate should be able to use the program as it stands, but in most cases a short conversion program will be required to drive the plotter and 'clip' any lines which extend beyond the drawing area.

Entering the program

Super Plot is in two parts, an assembly listing to generate the code used by some transformation routines and the main editor listing. Before doing anything else type:

*KEY10 PAGE=&2300:M NEW:M

Then press Break and type in the 'Source' listing and save it. When run, it will

assemble the resultant code from &1500 and print out the necessary command for it to be saved. If the listing contains an error the program will print a 'checksum error' message and you will have to examine 'Source' to find it. Once the code has been saved you should type in the 'Editor' listing. For de-bugging purposes it is only necessary to load 'Code' once and then insert a REM in line 30:

30 REM:*LOAD CODE

Tape users should save 'Code' and 'Editor' on separate tapes until correct, and then save 'Code' immediately after 'Editor'. In normal use PAGE must be set to &2300 and your system must allow &1500 upwards to be used for the data-files. For this reason *Super-Plot* will not run under ADFS on a B, B+ or Electron with Plus 3 which must maintain PAGE at &lD00. Once the program has initialised you will be presented with the *Super-Plot* logo over a framed drawing area containing a box-cursor on a blue background. After a few seconds the loading options appear and option '1' should be chosen if the program is being used for the first time. The arrow-keys move the box and the central dot represents the graphics-cursor. Normally there would be a choice between editing and drawing, however the editor does not respond until there is something on screen so move to a suitable starting-point and hit <Space> to begin rubber-banding. The cursor-keys will reveal a line which can be fixed by <Space> or wiped out by <Return>. Each time <Space> is pressed a new line can be banded from the old one; <Return> will reinstate the box-cursor. The cursor speed can be changed at any time with keys 'f1' (slow), 'f2' (medium), 'f3' (fast).

Using the Editor

To join two line-ends you should use 'Line-addition'. Hit 'f5' to enter the routine and then use the left/right cursors to move the box marker to the line-start. Fix this with <Return> then repeat the process for the line-end and the design will be redrawn with the new line. The marker for the end point has to be moved at least once (it can always be moved back) before fixing in order to prevent the <Return> key being read twice.

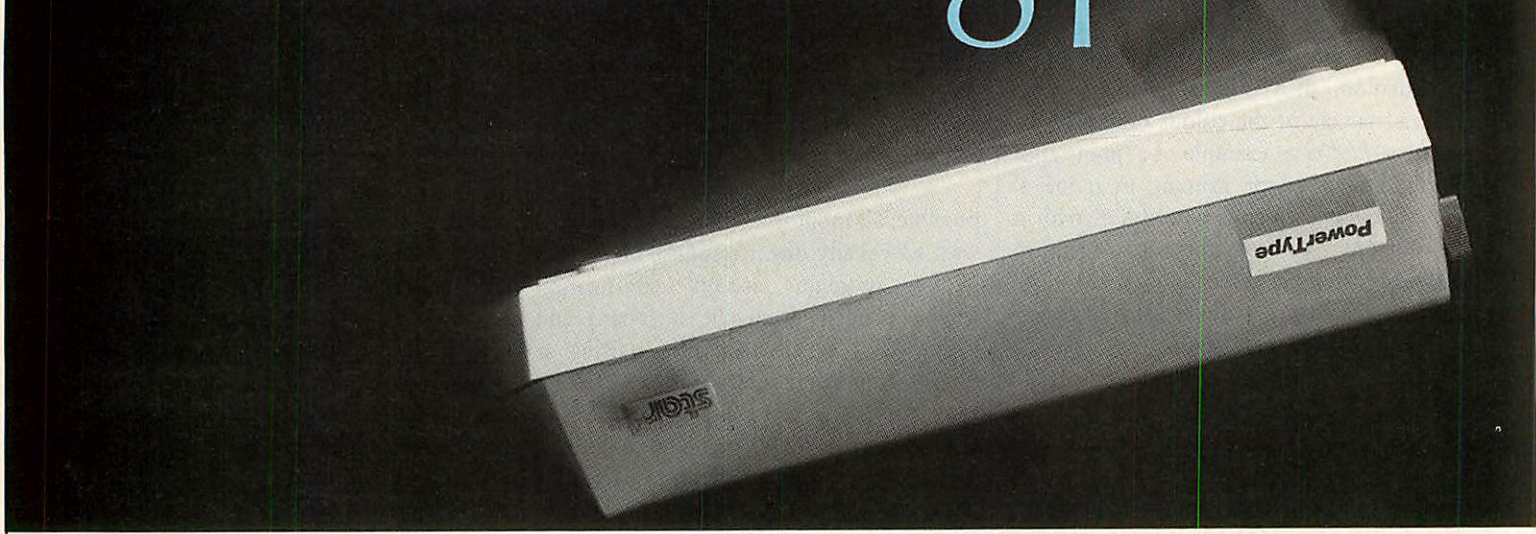
Using the rubber-band for adding lines to existing points is not good practice since extra 'unseen' points will be created and they can be a source of confusion during editing (not to mention being a waste of memory). If the line-end markers disappear during line-addition it is because they are superimposed and moving the seond one will reveal them again.

When any editing routines are re-entered the cursor will move to the last point edited; this is convenient because editing often requires repeated adjustment of the same points or lines.

Designs which have several isolated sections can be drawn by using the rubber-band option and then returning to the box-cursor between sections by pressing <Return>. Unless you are rubber-banding the shift, cursors and the other function-keys will enter the editing routines. <CTRL> will recentre the cursor, a useful command if the box-cursor gets lost after exiting from any off-screen banding.

Misplaced points can be relocated by pressing 'f7'; on entry to this routine the box-cursor jumps to the most recently edited point and, as with line-addition, the left/right cursors will move it to each point in turn. <Return> fixes it at the point to be altered and the cursor-keys can then be used to move it to the proposed position.

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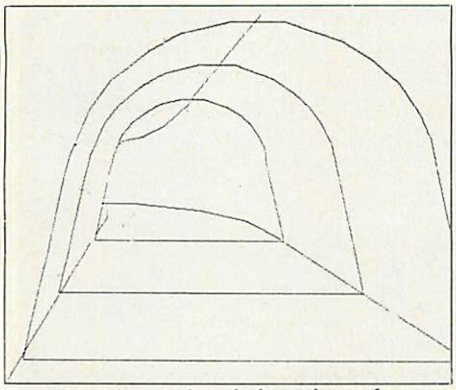
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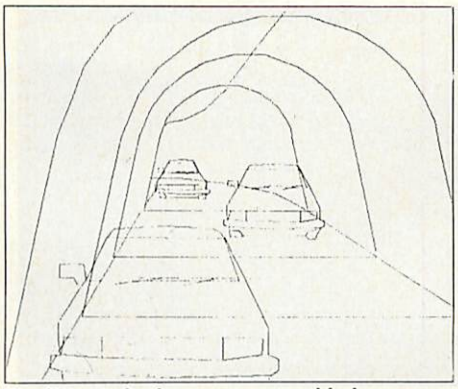
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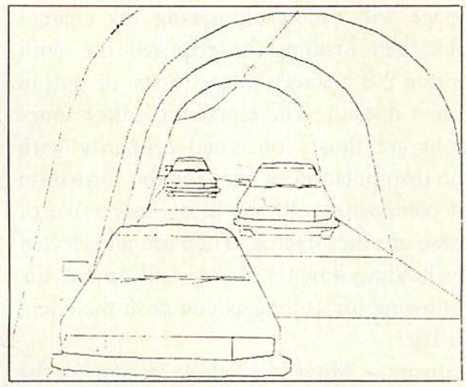
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Tunnel by repeated scaled versions of an arc



Car files and a larger arc are added



'Unseen' lines are edited out of the arcs

<Return> fixes this and the design will be redrawn with all the necessary changes. Enlarging the design using the Macro function (described later) will make the detail easier to edit.

Picture saving

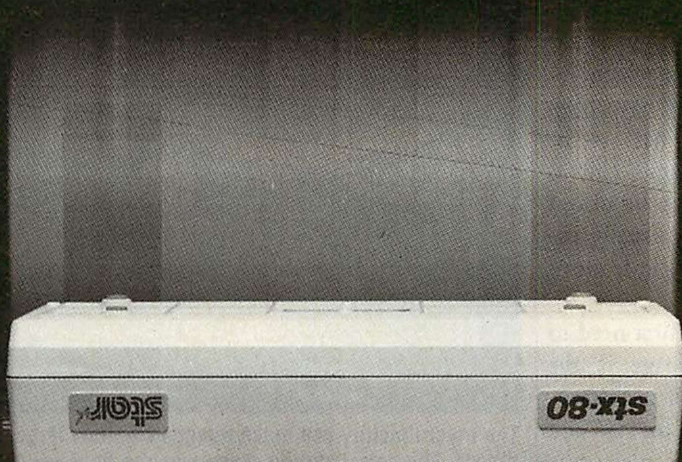
There are two ways to save a design:

If it is to be continued after saving hit 'f0' and enter its file-name; the program then displays the load options so that you can continue the design (choice 1), or load a design from store (choices 2 and 3). To save a design, or delete it and start a fresh one, you should press the <Tab> key, then 'Y' at the prompt for deletion or 'N' to keep it. If it is deleted the file's screen image is removed, but not those of any previously loaded files, and an opportunity to exit the program is given. Should you elect to continue, the load options will be displayed but this time option 1 will begin a new design. If the file was not deleted, the program reverts to the save routine used for 'f0'. At first glance this system might seem a little unfriendly but it is quite straight-forward once you are familiar with it, and it does ensure that you do not fill the screen with a lot of unsaved images (the source of more than a few moments of agony with earlier versions). <Delete> will delete all screen images and the current file so it should be used with care!

Motion pictures

Super-Plot also has a set of editing commands which will allow drawings to be continuously transformed, re-edited and compared so that they can be combined to form composite images. The files concerned should either have been saved during the current session, leaving a screen image, or they should be loaded in using load option 3. The file to be edited will be the last one loaded in. Changing to another

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____

image will necessitate saving the current file, then loading the required file with option 2 if a screen image exists, or option 3 if it doesn't. The remaining editor functions are those concerned primarily with the manipulation of files for the formation of composites and the most impressive of these are the Macros. They are all selected by holding down <Shift> and one of the following for as long as you wish the effect to last:

Cursors – Move the whole design in the direction of arrow.
Z – Rotates whole design anti-clockwise.
f7 – Shrinks whole design.
f8 – Expands whole design.

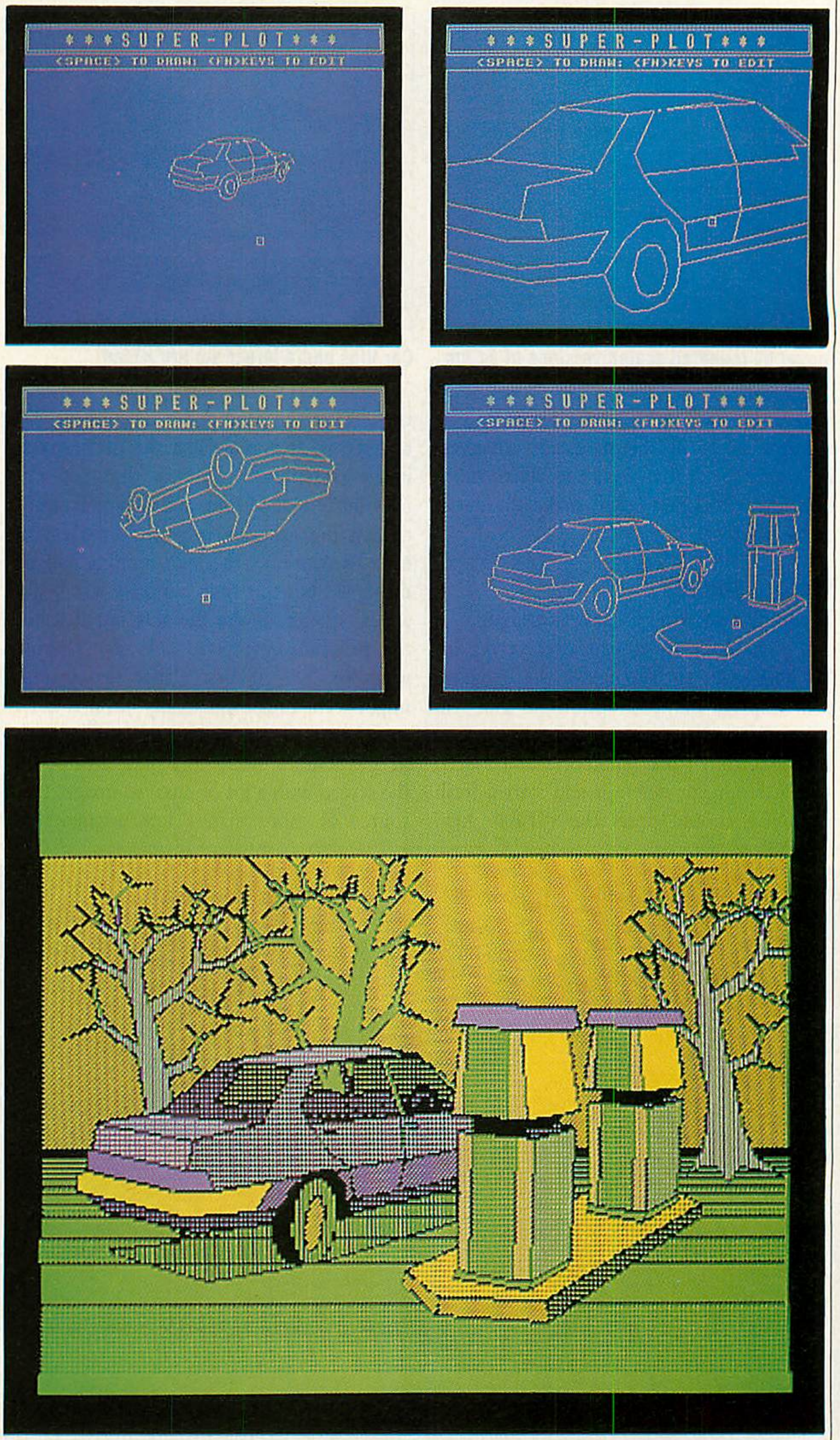
f3 and f4 shrink and expand about the X axis, f5 and f6 do the same about the Y axis. This is an exceptionally useful facility since it enables an image to be scaled, rotated and placed in any position on, or if you insist, off the screen. Function keys 1, 2 and 3 will change the speed of the design in the same way that they change the speed of the cursor. If the speeds used in the program are not to your liking they can be changed by altering the values of ic%(cursor) and ?speed%(design) in PROCcm in the Editor listing. The fact that these routines make the image 'move' cuts out the need to calculate and enter positions as X,Y co-ordinates (usually a time-consuming trial and error process which can best be described as 'user-opaque'). The mirror-image function (f4) also works on the whole design and does so by reflecting it about the Y axis.

Combining designs

There are two other functions which remain to be described and they have been included to enable 'hidden lines' to be edited out of combined images. This is necessary where two files are to be placed so that they overlap since it is usually the case that one must appear to be in front of the other.

In order to do this you will first need to check that the back-most image is the current file; 'f4' will reveal it if necessary.

To remove a complete line hit 'f6' and use the left/right cursors to place the markers at either end, <Return> will redraw the image without the line. In the case of lines which are only partly hidden use the hidden-line editor which is entered using 'f8'. Move the markers to the line-ends as described above. Once the line has been selected a cross, indicating the end to be changed, can be toggled back and forth with the space-bar. Press <Return> once



The macro facility can make images smaller, larger, appear upside-down or merge with others. The petrol station scene was the final result, coloured using *Super-Painter*

it is at the right end and use the cursor-keys to move the line back, pressing <Return> to fix it at the new position. <Space> will restore the original line if you change your mind.

These two functions are capable of rearranging the picture-files in order to remove redundant information, hence their length. This might seem an extravagance but it is extremely useful where there are large numbers of design-primitives requiring extensive line-removal or hidden-line editing. Tape-users will certainly benefit since files are unlikely to exceed four blocks.

Point-deletion has not been included as an option because the effects on any con-

necting lines can be unpredictable and in any case the line-editor removes them automatically as required. If you do happen to produce a surplus point it can be removed by deleting any lines adjoining it and the resulting space can be bridged by line-addition.

Dropping editor procedures

<Escape> has been programmed to exit from any routine being executed – a useful 'get-out' which will none the less preserve the current file and all screen images. <Escape> is disabled once the cross has appeared in the hidden-line routine; to escape from this procedure just press <Return> followed by <Space>. In order to end the program press <Tab> as described above.

DFS errors produce a prompt before returning to the loading options. A full catalogue or 'file not found' are the usual culprits; large catalogues are to be recommended if your DFS supports them.

Tape-users will see the usual 'Block?' style of prompt if there are problems and should press the Escape key to return to the main program.

Drawing hints

The keyboard is admittedly not the most elegant way to enter designs but, short of buying a mouse or tracker-ball, it is difficult to beat. I have yet to find a light-pen or graphics-tablet which can offer anything like the same level of accuracy. The best technique, and incidentally the cheapest to date is to trace an image on to thin acetate (the type used for overhead projectors) with a waterproof pen or chinagraph pencil. Static should hold the result to the VDU screen and then drawing is a simple matter of following the traced lines with the 'rubber-band'

The screen-shots show how a set of design primitives can be built up to form a composite picture. The colouring in various screen-modes was achieved by using the mode converter presented in the yellow pages. The converter asks which screen mode you want the final picture to use. You then enter the names of all the *Super-Plot* files you want to include in the picture, pressing Return by itself when you have finished. The screen will then be saved using a filename of your choice. If you want to load *Super-Plot* files into your own programs without first saving them as screen files, the easiest way is to include PROCload from the Editor.

Having saved a screen using the mode converter, it is a simple matter to load this file into any suitable painting-program; the landscape and service-station were coloured with *Super-Painter* and the seagulls with Goldstar's *Sketchpad*. The drawings show that a BBC micro is capable of matching the high image resolution of plotters and the service-station drawing has been embellished with colouring-pencils. The gull listing will compile a file which can be loaded into *Super-Plot* using the title 'Bird'. This file has been included on the monthly disc and tape together with the picture-files.

Super-Plot has been used to produce drawings for various purposes such as strip-cartoons, decorative borders and title-pages among others, and should certainly make a worthwhile addition to your computer's repertoire.

Macro-routines: How they work

The assembly listing contains three discrete sections for handling the effects of transformation, rotation and scaling of whole designs. After the workspace and variables have been set up by '.init' the keyboard is scanned to check that Shift has already already been pressed.

Assuming that this is the case then the keys are scanned again to check for a key-press which corresponds to a macro routine, control being passed to that routine if a match is found.

Rotation

This section is entered by pressing 'Z'; as with all macros the co-ordinates are processed as X,Y pairs beginning with the first and ending with the last. The same code operates on all points sequentially by using the 'Y' register to increment the value of the addresses in which the co-ordinate values are held. The process continues up to the number of points currently used, this information being held in &1AFF.

The new co-ordinates which result from rotation are calculated by the '.rotlp' procedure. This uses the normal formulae for finding the cartesian co-ordinates of a rotated point, ie, X'=X*cos(a)–Y*sin(a) Y'=Y*cos(a)+ X*sin(a) where 'a' is the angle of rotation. To speed things up the cos and sin functions are calculated using the first one or two terms of their Taylor-expansions; this is quite accurate enough for the graphics resolution of the BBC micro. For convenience 'a'=1/16 rads so that the cosine simplifies to 1–1/512 and the sin to 1/16. (The second term of the sin expansion is not significant for so small an angle.) The formulae to be encoded can be represented as:

X'=(X–X/512)–Y/16 Y'=(Y–Y/512)+X/16

The significant lines are:

2300-2370 divide X by 512
2380-2500 X-X/512: result in locations at1,2,3,4
2510-2590 Y/16
2600-2720 X result-Y result: put into at1,2,3,4: at=newX
2730-2800 put X into locations bt1,2,3,4
2810 divide bt1,2,3,4 by 16
2820-2890 store new X in Xlo,Xhi
2900-3060 divide Y by 512
3070-3190 Y-Y/512
3200-3320 Y result+X result: put into Yl0,Yhi

Translation

This routine handles the sideways movement of designs by adding an increment or decrement to the X or Y co-ordinate value. Depending on the key pressed a positive or negative integer is stored in 'overflow/store' and it is this which is added to the co-ordinates.

Scaling

This is rather more involved than translation since the magnitude of the co-ordinates' change of position will vary with its distance from the origin.

All the work is done by the '.scale' routine which operates as follows:

4540 loads accumulator with the X/Y flag
4550 branches to X or Y setup
4560-4650 puts X addr into bt1,2,3,4
4670-4740 puts Y addr into bt1,2,3,4
4760-4820 loads co-ords into at1,2,3,4
4850-4960 divides co-ord in at by 16
4990-5130 subtracts at from addr:stores in addr
5140-5270 adds at to addr:stores in addr

This procedure is repeated for either all X or all Y co-ordinates. The exact sub-routines used are chosen from the key-press, smaller or larger, and whether the co-ordinate is positive or negative.

Plotter drivers

To write a program which will convert *Super-Plot* files into plotter commands you will need to have a working knowledge of hexadecimal numbering and two's-complement arithmetic. Begin the program by using PROCload from the Editor listing to place the co-ordinate values in

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RAM; as written it puts the information in the following pages:

&1D00 : Xlo byte
&1E00 : Xhi byte
&2100 : Ylo byte
&2200 : Yhi byte

Within each page the first byte refers to the first recorded point, the second refers to the second point and so on up to a maximum of 254. To allow several lines or moves to refer to the same point a system of indirect indexing has been used; this works by having two blocks of information, the line type in page &1900 and the point index in page &1A00. To produce a drawing the program must loop through the following steps:

1) Read the contents of &1900: this will be &C for a 'Move' or &D for a 'Draw'.

2) Read the contents of &1A00: this contains the index of the point co-ordinates. For example, if &1A00 contains '6' then the point co-ordinates are in &1D06,&1E06,&2106,&2206. As 'Basic' expects four-byte integers it will try to interpret negative two-byte numbers as being positive. To correct for this your program needs to check the high byte of each co-ordinate. If it is greater than &7F then add &FFFF0000 which will make the integer negative.

Many plotters require the X,Y origin to be at the lower, left-hand corner of the drawing area and this is achieved by adding &280 to the X value and &200 to the Y value. The exact syntax which your plotter expects will be found in the user manual but most of them require a Micro-soft type of Print statement. From the BBC micro this means issuing FX3,2 to send output to the printer-port and then:

Print"M";X%;",";Y% to move the pen to co-ordinates held in X% and Y%, or

Print"D";X%;",";Y% to draw.

The process is then repeated from step 1 using the contents of &1901,&1A01 and so on up to the total number of lines; location &19FF holds this value.

A program of this type will function well enough with most images but will not deal properly with those which exceed the plotter's drawing area. The simplest solution to this problem would be to introduce a scale-factor but a more satisfactory one would be to use a clipping algorithm. Further information on this subject can be found in *Computer Art and Graphics* by Axel Bruck.

The index to the yellow pages on page 113 has details of where to find the Super-Plot listings and how to enter them.

Outline instructions

At start-up the loading options appear:
1 Start drawing
2 Load file without image
3 Load file with image
Options are repeated until 1 is pressed.

CURSORS move box-cursors around screen
SPACE starts banding from cursor – arrow keys move free end
RETURN drops band, returns to box-cursor
SPACE fixes band – starts new one
f0 – Save design
f4 – Mirror image
f5 – Adding lines. left and right cursors move marker to start point. Return fixes. left and right cursors move markers to end point. Return draws line, returns box-cursor
f6 – Line removal. Left and right cursors move markers to chosen line, Return removes it, returns the box-cursor
f7 – Point edit. Left and right cursors move markers to chosen point. Cursors move box to the point's new position. Return redraws design.
DELETE – Wipe whole drawing area
f8 – Hidden lines. Left and right cursors move marker to chosen line, Return fixes, Space moves cross to chosen end. Return fixes. Space restores old line.
CTRL – Recentre cursor
Tab – Save design/delete design: exit/continue program
Escape – Exit current editing option or rubber-banding
New files can be started after Tab is pressed.
Files can be loaded after Tab or file-saving.

Macros

Shift + cursors Move whole design
Shift + Z Rotate design
Shift + f3 Contract about X axis
Shift + f4 Expand about X axis
Shift + f5 Contract about Y axis
Shift + f6 Expand about Y axis
Shift + f7 Contract whole design
Shift + f8 Expand whole design
f1 Slow cursor/design speed
f2 Medium cursor/design speed
f3 Fast cursor/design speed

This summary of the keys will help you use Super Plotter, including its Macro facility

	f0	f1	f2	f3	f4	f5	f6	f7	f8	f9
	Save design	Slow	Medium	Fast	Mirror image	Added lines	Line eraser	Point edit	Hidden lines	
Shift	Speed setting of design – trans forms and cursors			About X axis Contract	About X axis Expand	About Y axis Contract	About Y axis Expand	Whole design Contract	Whole design Expand	

Cut out or trace this function key strip to help you use Super Plotter

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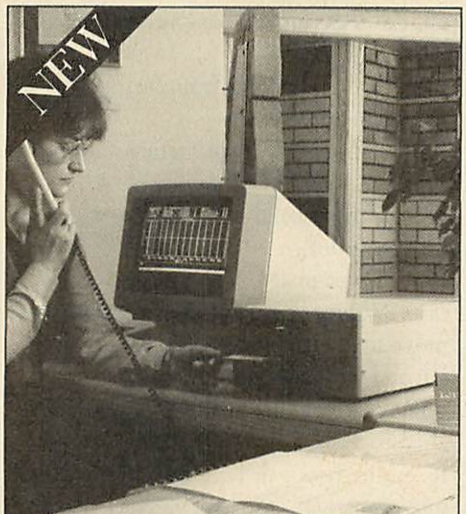
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A DAY AT THE FLICKS



You can flick rapidly between two screens to produce smooth animation on the Master – now you can use the same technique on the Electron or BBC B

Peter Voke

Owners of the old faithful 32k model B BBC micro may be forgiven for feeling a bit like second-class citizens, with all this talk of B+s and Masters. No doubt there are many advantages with the new machines, not least the extra memory, and in particular the shadow memory. Yet some of the same tricks that can be done with shadow memory can also be used on the unexpanded BBC model B.

The simplest and probably the most useful example is the facility on the Master 128 to maintain two screens (one in ordinary memory, one in shadow memory) and to flick very rapidly between them in order to produce smooth and fast animation, or other graphical effects. This is done on the Master 128 using *FX113. It is also possible to specify where PLOT commands will write to using *FX112 – and the screen the machine does its plotting on does not have to be the same one that is being displayed. As a result it is possible to change one of the screens while the user of the program is looking at the other, and switch over when the hidden screen is ready. The result is beautifully smooth animation.

Now clearly we cannot do this on the model B or Electron if the two screens are both supposed to be mode 1 or mode 2 screens. There simply is not enough memory for two 20 kbyte screens. But if we restrict our attention to mode 4 or mode 5, then it turns out to be very easy to fool the computer into working with two screens.

Listing 1 is an example of smooth, *Elite*-like rotation (in colour) using mode 4. Nearly all the parameters used by the operating system are set up at the beginning by the MODE 4 statement. This is immediately preceded by a MODE 1 statement because, with two mode 4 screens in use, we wish to clear the memory initially all the way from &3000 to &7FFF, not just from &5800 to &7FFF. The MODE 1 statement is an easy way to do this.

For the same reason, the memory marker HIMEM must be put at &3000.

Since both the screens we want to use are mode 4 screens, things are considerably simplified, even though the two screens are in different parts of the memory. All that is needed is a way to get the computer to use two different parts of memory as screen memory. This is done by PROCscreen. The procedure has a single integer argument A%, which is set to 1 or 2 depending which of the two screens we wish to work with or have displayed. To change the part of memory displayed, we must program the 6845 chip in the computer, the cathode ray tube controller.

The register of the 6845 concerned is register 12, which must be programmed with one eighth of the high byte of the address of the start of screen memory. (This address is the exact value HIMEM has if we switch to the mode in question.)

In other words, we have to put 11 (=&58/8) into this register to make mode 4 screen memory start at &5800, as it normally does, and 6 (=&30/8) into the register to make the screen start at &3000. This is the place for the screen memory to start if we want a new, separate mode 4 screen in memory at the same time as the normal mode 4. This new screen I have called a dual screen.

BBC Basic provides a simple method of programming a register of the 6845 from within Basic. To set register 12 to a value of 6, we use VDU23;12,6,0;0;0; (see page 385 of the User Guide). PROCscreen does precisely this, setting register 12 to 6 when PROCscreen is called with an argument of 1, and to 11 when it is called with 2. So screen 2 is the normal mode 4 screen (M%=11), and screen 1 is the dual screen (M%=6).

This is enough to control which of the two screens is displayed. We now have to make sure that the operating system is also fooled into doing any PRINT, DRAW or PLOT statements on the screen we choose. The high byte of the start of screen memory (&30 or &58) must be put into two page 3 locations, &34E and &351. Normally these are set to the proper values by the operating system whenever a mode change takes place, and would therefore contain &58 for modes 4 or 5.

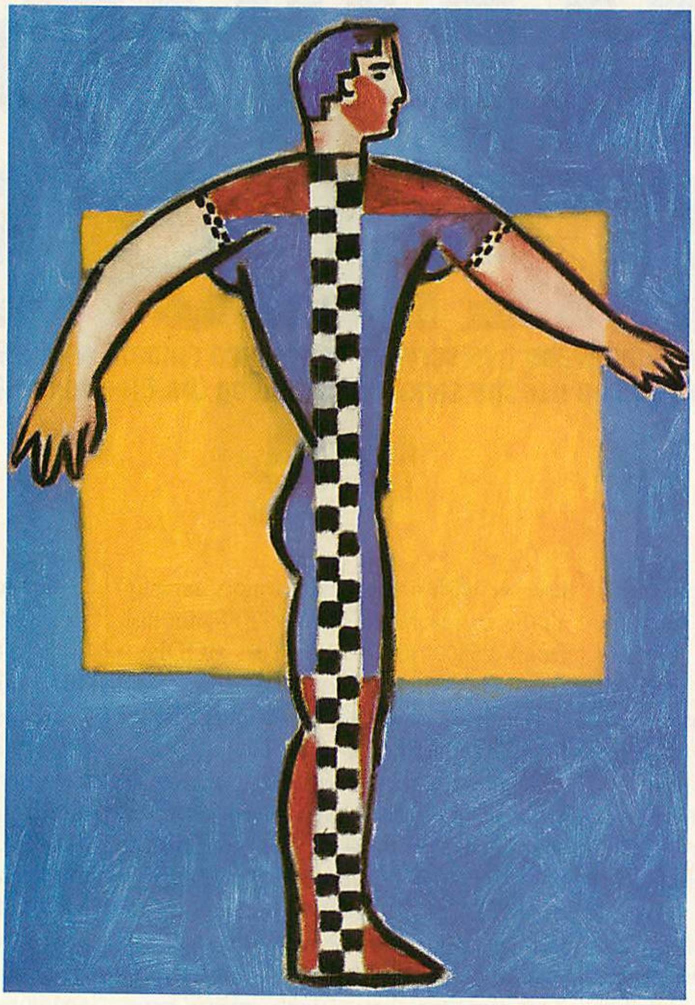
The value we want to put in is &58 for the normal screen or &30 for the dual screen, respectively eight times the values sent to register 12 of the 6845. So we put M%*8 into these two locations.

The alert reader, who has already tried listing 1, will immediately object. PROCscreen in listing 1 does *not* put 8*M% into the page 3 locations, but 8*N%, having just set N%=17–M%. A moment's thought should reveal the purpose of this trick. When M% is 6, N% is 11, and when M% is 11, N% is 6. So the high byte address that PROCscreen puts into the operating system page 3 locations is the value for the wrong screen!

When the dual screen is being displayed, the operating system thinks the normal screen is being displayed – and vice versa. This will not affect the display at all. It just means that, at any moment, PRINT, PLOT and any other commands will affect the screen we are *not* looking at. Drawing and writing are done on one screen while we are looking at the other. This is exactly what is needed for smooth animation. The rest of listing 1 is not strictly part of the

ILLUSTRATIONS BY IAN HANDS

subject of this article, but in case someone is inspired to a full colour version of *Elite* based on these methods, I shall make a few comments. The lines starting Y%=Y%+X%DIV16, and V%=V%+U% DIV16 are an old and well-known trick for getting a vector with components X% and Y% (or U% and V%) to rotate, without computing sines and cosines (which would take ages). This algorithm is very easy to machine code. Normally one would only need a single line like line 70, but in this case one has to keep track of triangles on two different screens, and make sure that each triangle on the dual screen is intermediate between the triangles preceding and following it on the normal screen.



PROCdraw deletes or draws the triangle (on the screen we are not looking at) according to whether its first argument is 0 or 1. The VDU19 in line 310 is used to make the triangle change colour when it turns round. Listing 1 will work equally well for mode 5, if you want four colours and coarser resolution. Change MODE 4 to MODE 5 in line 60.

One warning: there are a few operating system actions that do not use the addresses in page 3, but instead look up the addresses in the OS chip, and therefore cannot be so easily fooled. The first of these is CLS, which should never be used with a dual screen unless a text window is in action, since it will always clear the normal screen. The other thing to avoid is hard scrolling, that is, scrolling text when no text window is defined. This gets the operating system and the 6845 confused if a dual screen is active, and you end up with bits of both screens on display.

Listing 2 uses mode 5, but exactly the same PROCscreen. I have included it to illustrate a rather different approach to the problem of controlling which screen is displayed. The never-ending loop in the main program checks for input from the keys Z, X, * and ? and moves a couple of characters to new positions on the two screens – drawing, as usual, on the screen that is not being displayed.

By making the two characters different rather than the same, a flickering effect in the moving character is obtained, without having to do any extra work to obtain the flicker. I chose to use the letters O and I on the two screens (see line 340) to save space and trouble: in a real arcade game one could use slightly different images of a fish, man or bird to produce the impression of swimming, running or flying. The background has also been drawn a little differently on the two screens, to produce a rippling effect like water.

You may wonder why the images in listing 1 do not also flicker. Usually animation must make use of a *FX19 ('wait for vertical sync') to avoid flicker, and even then the timing may not be right. With dual screens this hardly seems necessary, since the VDU23 and the two 'pokes' take very little time, and switching between two very similar images half way through the scanning of the screen still seems smooth to the human eye.

So far I have only considered the use of dual screens of the same mode to achieve smooth, flicker-free graphics. This is the easiest type of dual screen to implement (unless you are wanting several mode 7 screens, which cannot be done by the dual screen method). But there are other, very different applications, where the two screens are different modes. The combination I shall deal with in the remainder of this article is the most difficult: the combination of a normal mode 7 screen with a dual graphics screen.

Applications immediately spring to mind. Text-plus-graphics adventures, where the player (or perhaps the program) can flick rapidly from the teletext to the graphics screen; arcade games where the player can quickly check the score, time remaining, strength rating and so forth on the mode 7 screen while the fast action continues unabated on a mode 2 screen; or graphics utilities that allow manipulations to be done on the graphics screen whether the user is looking at them or at the controlling menu on the other screen.

The advantage of combining mode 7 with a graphics mode is that it only requires one kbyte to store it in addition to the normal graphics screen memory. So mode 7 with mode 0, 1 or 2 will have HIMEM at &2C00 instead of the usual &3000. The mode 7 screen always has to be at &400 bytes. (You can't have a dual mode 7 screen so far as I know; somebody will prove me wrong no doubt.)

Listing 3 is a very simple example of how to combine mode 7 with mode 1 for a graphics utility. When you have it working, it should assemble some machine code, flash a bit, and finally settle down to a mode 7 menu. SB stands for Space Bar; pressing it takes you over to the graphics screen, which initially should have a large red triangle on it. Press Space Bar again to get back to the menu.

Whichever screen you are looking at, pressing 3 will result in a short machine code routine being called which changes the graphics screen into a monochrome line drawing. The test screen, a red triangle, will be changed into a white outline triangle on a black background. This is unexciting unless you have had difficulty getting the program typed in correctly.

More interesting is loading your own graphics screens and processing them, either for fun or for dumping afterwards

on a printer. You need your mode 1 screen, saved on to disc or tape under the name 'screen'. Pressing 1 will then load it, and after processing using option 3, option 2 will save it under the name 'newscr'. It is then ready to load normally into mode 1 screen memory at &3000. Graphics screen compression should work if you use it.

The process being carried out is simple and equivalent to the Basic procedure:

```
DEFPROCprocess
FORX%=0 TO 1280 STEP4: FORY%=1020 TO 0 STEP4
IF POINT(X%,Y%)<> POINT(X%,Y%-4) THEN GCOL0,3 ELSE GCOL0,0
PLOT69,X%,Y%: NEXT: ENDPROC
```

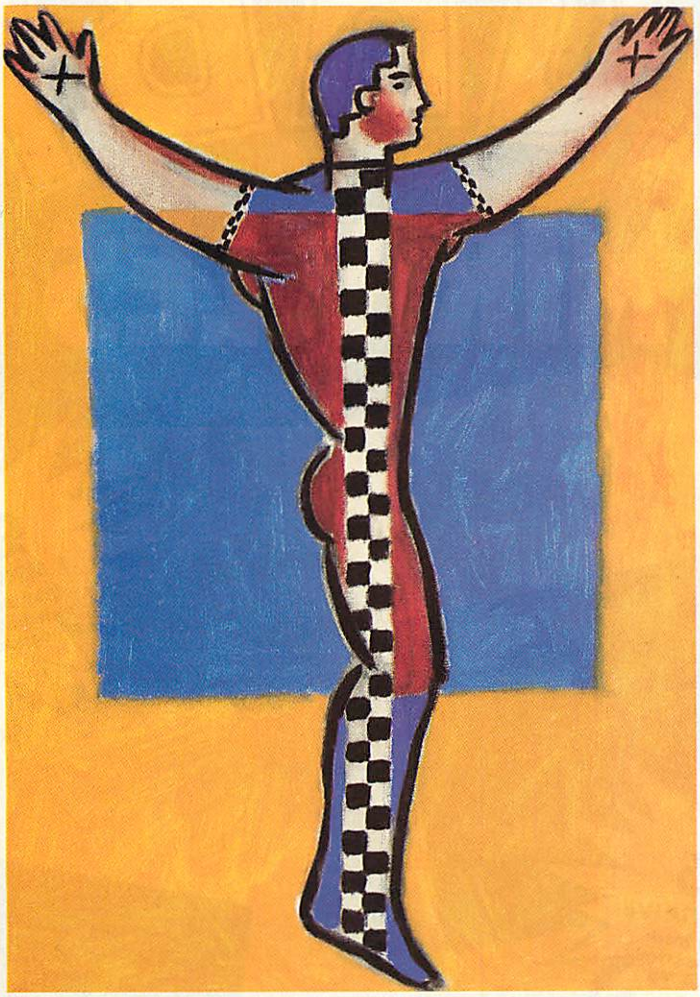
Processing a screen several times can give a more artistic effect than just using the process on it once. Press 3 a few times to see the effect. If you want to process arcade screens in this way you may want to do the same job on mode 2 screens, so here are the changes needed: Change MODE 1 in line 70 to MODE 2.

Change RESTORE 1280 to RESTORE 1320 in line 140, end include lines 1320 to 1340 in your program if they are not already in.

Change line 670 to read: 670 LDA #&55
Add line: 835 AND #&3F
Add line: 1145 ENDPROC

Now some comments on how the dual screen works. Because the two screens are different modes, it is necessary to tell both the 6845 and the operating system a lot more each time you switch from one screen to the other. As a result PROCscreen has to be a bit longer. The best way in Basic is by using DATA statements. These are included for modes 7, 1 and 2 between lines 500 and 620. In each block of data is included: (a) 14 numbers to be sent to the 6845 registers 0 to 13; (b) 20 numbers to be put into page 3, from &34E to &362; (c) a number to be put into &E0; (d) a number to program the ULA using *FX154,X. In the following paragraphs, I shall constantly refer to these distinct sets of numbers as (a), (b), (c) and (d).

If you need to work out numbers to go in a data block for some other mode, proceed as follows. For (a), look them up in the *Advanced User Guide* by Bray, Dickens and Holmes (chapter 18) and adjust registers 12 and 13 for the lower screen memory address you want to use. For (b), switch to the mode as normal, and read them out of memory, being careful not to allow hard scrolling; preferably don't PRINT at all after the mode change.



Then adjust those values you need to for the dual screen, namely &34E and &351. For (c), the number can be read from &E0 at any time when you are in the right mode. Finally for (d), the values are tabulated on page 379, chapter 19, of the *Advanced User Guide*. AND the value with &1F if you don't want a cursor flashing on the screen.

The DATA blocks in listing 3 are those you would use to get the operating system to PRINT and PLOT on the same screen that is being displayed. To PRINT and PLOT only on the graphics screen, the (b) set of numbers and the (d) number can be omitted, together with the lines in PROCscreen that use them (lines 170 to 190 and 210). To get the operating system to PRINT and PLOT on the screen that is not displayed you would have to swap the (b) sets of numbers in the DATA blocks, and the (d) number also.

Listing 3 does not need to do this because the machine code utility manipulates the bytes of screen memory directly, completely bypassing the operating system. This is what you are most likely to want to do in an arcade game, using sprites, or for graphics utilities. Listing 3 does not produce a smooth jump from one screen to the other. The screen shudders and jumps before it settles, like it often does in a mode change on the BBC micro or Electron. This is because we are not changing the 6845 registers fast enough or at the right time.

The situation in machine code is quite different. PROCscreen can easily be put into machine code, speeding things up enormously, but some advice will smooth the path of those wanting to do this. First, treat the dual screen mode change as an interrupt. Either put it as an intercept on the vertical sync interrupt, or, if you are not up to such sophistication, use an OSBYTE19 (*FX19) at the beginning, and then set the interrupt disable flag before proceeding. Having disabled interrupts, program the 6845 by storing direct in locations &FE00 and &FE01 rather than using VDU23, which is much slower. (Of course all this can only be done from the Beeb itself, and will not do at all from a second processor.)

Having followed this advice, you will still find an appallingly jerky transition from the mode 7 screen to the dual screen. This is because the mode change needs to be done about 100ms after the vertical sync interrupt. Since the vertical sync occurs every 400ms, this is quite a long time. I have found that a superbly smooth transition from a normal mode 7 screen to a dual mode 1 or mode 2 can be achieved with the following machine code:

```
LDA#19: LDX#0: LDY#0: JSRosbyte
SEI: LDX#0: LDY#&AO
.wait DEX: BNEwait: DEY: BNEwait
/ the main screen switch assembly code here CLI: RTS
```

See page 113 for details of where to find Peter Voke's listings

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MICROPOWER

MASTER COMPACT GREAT AND SMALL

What do you get for your money with the new Master Compact? Here compared to its big brother, the Master 128

David Atherton

The Master Compact is the latest micro to be launched by Acorn and builds on the Amstrad concept of 'one plug' supplying everything required, thus minimising the necessity for separate boxes and cables. Unlike any previous Acorn micro, the Compact is being sold with a bundled disc drive and monitor. As with Amstrad, you must buy computer and disc drive together. However, the choice of a colour or monochrome (green) monitor or a TV adaptor is available.

In essence the computer is a Master 128 in a smaller box with printer, disc and joystick interfaces. All other interfaces are removed, as is some of the system software. The purpose, of course, is to produce a lower cost machine. See the panel (right) for a detailed rundown of the differences.

The system is packaged in three boxes, one containing the monitor, another the disc drive and finally the keyboard/computer. It assembles as a light moveable keyboard in front of a monitor on a stand. The keyboard can be pulled a foot away from the monitor. The keyboard is almost identical to the Master 128, in a case styled on the Acorn Communicator, measuring 426 × 219 × 75mm, about half way between the width of a model B and a Master, and about two-thirds the depth of a model B.

The drive-come-stand is a neat flat box measuring 351 × 333 × 95mm. Computer and stand are in the standard BBC cream colour with dark panels and logos. The drive is a Sony 3.5in unit, and is double-sided, double-density 80-track. Like all 3.5in drives it uses a button eject. The power supply for drive and computer is contained in this box. A mains feed for the monitor is supplied. All mains is fed on IEC320 plugs and sockets (like modern kettles and Epson printers) and for the first time on BBC computers, you can disconnect the mains wire at the computer end. This is helpful when moving the computer and other equipment.

The monitors are excellent. Both mono and colour are high-quality Philips models, the colour model is a 0.42mm dot pitch, the level generally billed as high resolution. 80 column text is perfectly legible on the colour monitor.

The mono monitor has even better resolution, easily exceeding the highest resolution (640 × 256) generated by the computer. A monitor lead is also supplied.

The kit is built to high standards and will provide several years' service, just as BBC micros have done.

There are eight sockets located on the back of the machine. From left to right they are composite video; RGB video; Econet; RS232; Joystick/Mouse; printer; disc drive; and power input.

The composite video and RGB sockets are for the mono and colour monitors respectively. If you intend using your own monitor with the Compact, the RGB connection is the same as other Acorn/BBC micros. The mono connector is an Electron-style phono socket.

Standard Econet and RS232 sockets are optional upgrades, so as nothing is connected to them, they are covered up. The RS232 upgrade is just four plug-in chips, and the Econet module is the same as that supplied for the Master 128.

The ANFS version 4.23 or later is required for the Compact to function correctly on the network. All Acorn stocks are being updated, but if you are buying

DIFFERENCES BETWEEN MASTER 128 AND MASTER COMPACT



Missing – Cassette port, Tube, 1 MHz Bus, serial port (available as an upgrade), A to D converter, Audio in/out, domestic TV output, cartridge ports, internal modem connector, auxiliary power, real time clock, *ViewSheet*, *Terminal*, *Edit*, Disc Filing System.

Different – smaller box, size and speed of discs, mains power supply unit in disc drive, disc and printer plugs, composite video is mono only, non-volatile setting is now done with an EEPROM – so no battery, joystick port different and switched joysticks only, User Port is now split between joystick/expansion bus, serial upgrade is RS232 not RS423.

Extra – digital Atari-compatible joystick port (also for mouse and trackerball), code key system, 5V in jack, general purpose expansion bus and connector, increase to four internal ROM sockets, general improvements to the MOS/Basic, bundled utilities particularly ADFS, extra bundled software – Logo, *ABC*, *Desktop*, sprites, *CardIndex*, *Notebook*.

from a dealer check the version number of the ROM. The disc and printer connectors are the same as previous BBC micros, but have been physically changed. The disc cable now connects to a 25-way D-type connector (like the RS232 socket on some micros) and the printer to a 24-way Delta. This is not of crucial importance for new users as the correct cable is supplied for the 3.5in drive and printer cables will be no more expensive than before. If however you are upgrading and you already own a drive and printer, then you'll have to spend about £20 on new cables, or make them up. All the pin labels are to be found in the back of the Welcome Guide.

The joystick input has completely changed. The old analogue-to-digital chip on previous machines has been replaced by an Atari, Commodore and Amstrad compatible switched joystick socket. Acorn bills this as a joystick/mouse socket, and states people who already work with mice should plug them in there. A QuickShot II joystick was tested and functioned without any problems.

The Operating System will read switches or will emulate the analogue system. The latter allows compatibility with existing joystick options on programs. The sensitivity is altered by *FX 190. Response time was a little slow in some games. This is only a compatibility issue – games altered specifically for the Compact should have better response.

The keyboard has only slightly changed. The @ symbol shares a key with zero, and the position it vacates is now known as the code key. If this key is pressed in conjunction with CTRL and Shift, then the next key pressed has 128 added to its ASCII value. This has been provided for international versions of the machine, but is also a useful method of typing colour codes directly from the keyboard.

There is a 50-way expansion edge connector on the right of the machine. This has most of the user 6522, FRED and JIM selects (and address lines), and miscellaneous lines such as CRTC light pen and reset. Two ROM slots can, by moving a link, appear on the expansion bus, allowing hardware and software in one box. The bus is similar to the cartridge outlets on the Master 128. Acorn expects that third parties will produce additional boxes.

This machine sports four ROM sockets, as well as four banks of sideways RAM. One socket will take 32k chips in the same way as the B+. The other slots are taken up by the OS, which duplicates iteself in slots 9–12. The four ROM sockets and four banks of RAM are a good combination, plus there are no expensive cartridges to buy. The sockets are easily accessible on the right-hand side of the circuit board. It is possible to fit a 128k ROM in place of the 64k ROM supplied. This, Acorn says, is for international variants of the machine – not for a Master 128 megaROM!

No monitor version	£458.85 (Modulator extra)
Mono monitor version	£539.35
Colour monitor version	£688.85
TV Modulator	£29.90. Available October
RS232 upgrade kit	£25–£30. Available October
Econet upgrade kit	£49.95
Second disc drive (dealer upgrade)	Around £125. Available October
Switched joysticks	Around £10 (QuickShot II)
Mouse	Around £30–£40
3.5in discs (blank)	Around £28 per box of 10
Software on 3.5in	£1.50–£2.50 more than 5.25in

Price range of the Master Compact (prices inclusive VAT)

	Model B OS1.20 Basic 2	Master 128 OS3.20 Basic 4	Compact OS5.00 Basic 40
BM1	0.65	0.54	0.54
BM2	3.20	2.63	2.50
BM3	8.27	6.14	5.98
BM4	8.96	6.32	5.99
BM5	10.36	7.69	7.37
BM6	15.41	11.90	11.50
BM7	23.06	17.88	17.42
BM8	52.41	29.28	23.05
Average	15.29	10.30	9.29

All times in seconds

PCW benchmark tests for BBC B, Master 128 and Compact

The 210 page Welcome Manual is well written. Once again, Acorn has left the detailed information for its technical books, and has concentrated on novice users. The bundled software is well documented with 22 pages on *View*, 14 pages on *ABC*, and 14 pages on the other programs. Logo has its own manual. A third of the book is devoted to BBC Basic and there is a detailed section on using ADFS, the standard filing system.

The Operating System supplied is essentially that of the Master, with code removed where hardware is missing. Acorn has also taken the opportunity to make improvements, for example the *SRLOAD command to install a ROM image into sideways RAM, can now be suffixed with 'I' and the image will be initialised as a ROM, without the need to press Break. The only other firmware supplied is the Advanced Disc Filing System (ADFS) and the latest version of Basic.

The disc drives are faster due to recoding of ADFS, including a change in the formatter, the use of the faster 1772 disc controller chip and the 3ms track-to-track speed of a 3.5in drive. The Compact is consequently about 25 per cent faster. A simple test program took 9.68 seconds on the Master, 7.84 on the Compact.

Acorn claims the floating point operations in Basic are now much faster. The following line of code was run:

```
TIME=0:FORI=1 TO
1000:A=SIN(PI)*COS(PI):NEXT:PRINT
TIME
```

and gave 1137 on a standard Master 128, 612 on the Compact. This example shows Compact Basic to be 85 per cent faster so Acorn's modest claim of 30 per cent is believable. The *PCW* Basic benchmarks recorded about 5 per cent extra speed on each except for BM8, which contains the LOG and SIN functions – this ran 27 per cent faster, in line with Acorn's claims. This is excellent for an 8-bit micro.

The amount of bundled software with each new machine nowadays is getting greater and greater, and the Welcome disc contains a healthy 32 programs, taking half

a megabyte from the 653k total space on the disc. Virtually all the programs bundled with the Master 128 are on the Compact, plus interesting new additions – the most immediately apparent appears as soon as you start up the disc. This is Desktop, an implementation of the fashionable WIMP (Windows, Icons, Mice and Pointers) environment, made famous on the Apple Macintosh, and seen in products such as AMX *Pagemaker*. The Desktop provides a neat method of accessing the other programs on the disc. Sadly, it won't recognise any programs other than those supplied. There are a number of Desktop utilities – a card index (database), a 16-page notebook, a calculator, clock, and catalogue display. The items can be placed anywhere on screen, and moved around as the user needs. Selections are made with keyboard or mouse/joystick.

Logotron Logo was the most popular of the four versions released for the BBC micro, and Acorn has bundled this into the Compact instead of its own Logo. A separate comprehensive 54-page manual is supplied. *View*, Acornsoft's famous wordprocessor, is supplied. New additions include a *CONFIGURE command, so that the start-up state can be set. In addition, all 255 characters can now be typed, some via the code key (see above), which allows symbols and international characters. A good printer driver would be needed to get these extra characters on to paper. Oddly, while altering *View*, Acorn didn't remove the date and time-stamping feature, which aren't useful as the Compact doesn't possess a clock.

A children's wordprocessor called *ABC* is incorporated. *ABC* has won two awards in this year's British Microcomputing Awards and received favourable reviews. The program is well documented in the Welcome Guide, and a keystrip is provided which reverses for use with *View*.

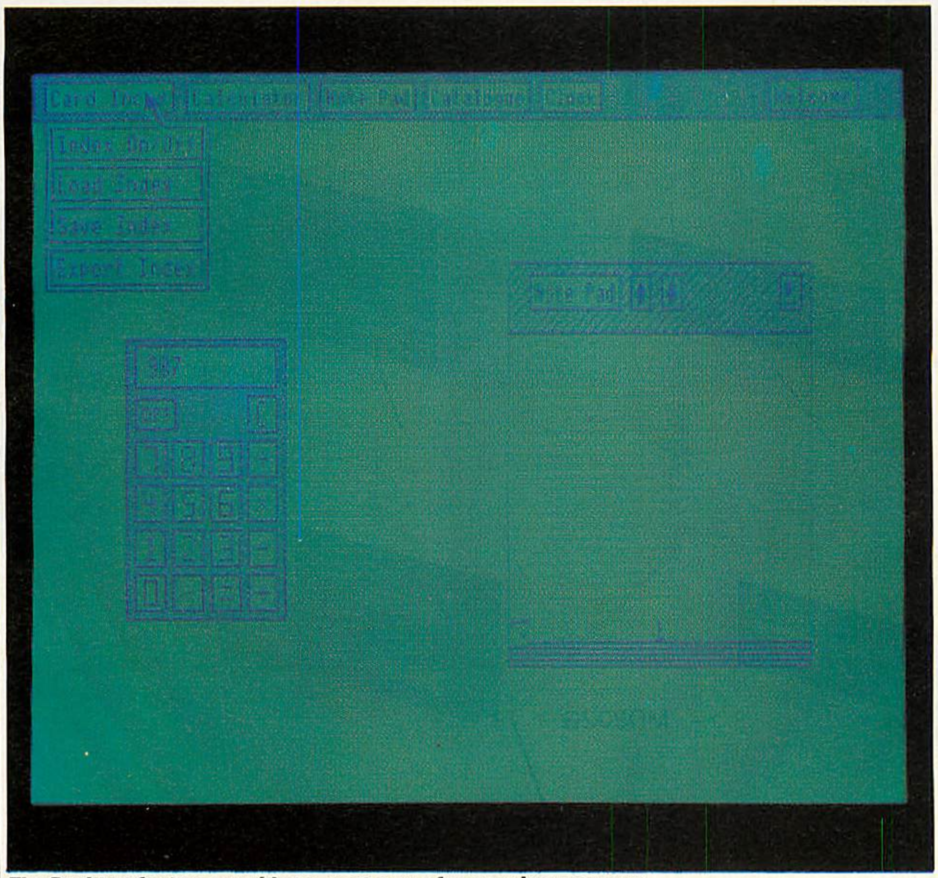
Utilities such as the drawing program *TimPaint* are available on the disc. Other utilities include character and envelope designers, an extended fill pattern editor, a control panel for the non-volatile settings (these are now on an EEPROM which requires no battery), several ADFS utilities and text and graphics screens.

Even with free software users will require additional items for their new computer. Acorn recognised this fact and earlier this year, took many software houses into its confidence, supplying prototypes and information. The outcome of Acorn's forethought is an impressive list of titles at launch – 28 games, 82 educational packs, 35 utilities, and 17 business programs are detailed – the last two categories contain a few ROMs. Software houses are evidently confident enough to engage in expensive 3.5in disc production for a new market.

Is it worth buying? The answer is yes, but it depends on your needs. In essence you have a cut-down Master 128 – at a better price. The Compact out-performs the model B and model B owners who didn't upgrade when the Master 128 appeared may consider doing so now. However, hang on to the mains-powered 5.25in disc drive and DFS. Acorn has made sensible cuts in the specification. The lack of cassette port will cause a slight delay while suppliers alter their products.

What about the price? It's very low by Acorn standards. If you require a BBC micro system for wordprocessing, games, amateur programming and education, the Compact is cheaper than the BBC B. If extra input/output ports are a necessity for scientific and control work, or 5.25in discs, cassettes, cartridges are specifically required – then a Master 128 would be much more suitable.

David Atherton will be presenting a series of articles specifically aimed at Compact owners. Next month he shows how to personalise the Desktop software, and in future issues will give you advice on choosing and using joysticks, performing the RS232 serial interface and documenting the Pointer ROM code supplied with your compact!



The Desktop feature provides a neat way of accessing programs



The Compact Applications Menu



***ABC*: A children's wordprocessor**



THE ULTIMATE RANGE

Because there's a vast number of applications for the BBC master computer, it stands to reason that there ought to be an equally large number of memory devices to deal with every requirement.

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So now you can plug in a Nucleus 20 which combines a 20MByte Winchester, 10MByte tape streamer and 1MByte floppy drive, or if you prefer there is the Archive which incorporates a 1MByte disk drive with a 10MByte tape streamer. So whatever your requirements you'll find a unit in the UFD range that's right for you.

All Akhter products come in colour matched BBC beige and are supplied 100% function tested, complete with user manual and connection cables. If you would like any further information contact your local dealer or telephone Akhter on (0279) 443521.



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MD802DM	800K 40/80 T DS PLINTH & PSU	£324.95	NUC 20	20MB HD 10MB TAPE 1MB FLOPPY	£1799.95
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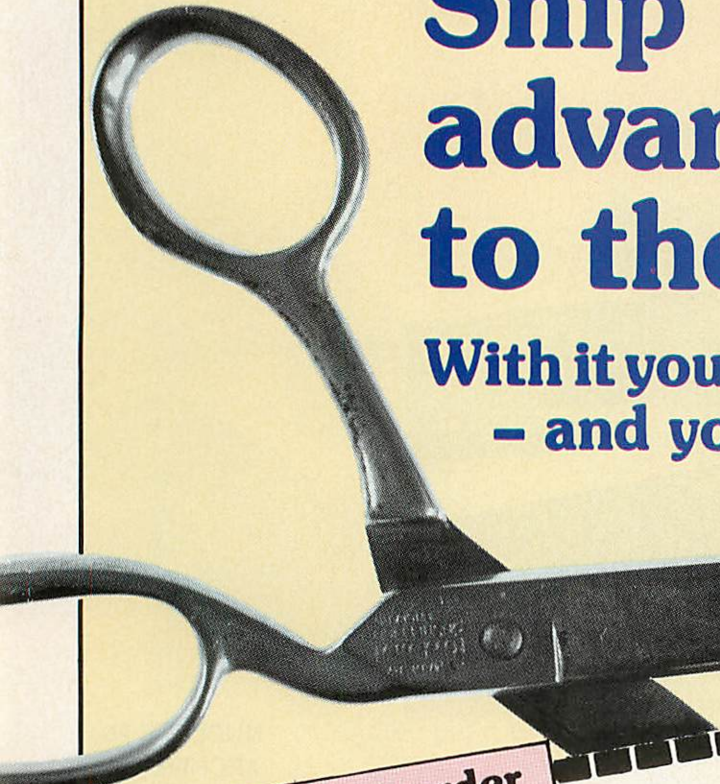
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ELECTRON & BBC MICRO USER SHOW

New Horticultural Hall, Westminster, London SW1

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10am-4pm, Sunday November 9

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DON'T MISS IT!

COMPETITION

FIVE BAR CODE READERS ARE UP FOR GRABS

If you're good at decoding you could soon be barcoding! Decipher our codes and you could win a bar code reader to end the blues of typing in listings



KSAD LZW QSUZL

TCZZCK AS VCAS

ZPTWSL ZPTVU ZHFZ

The idea behind this month's competition is very simple. There are three secret messages below and all you have to do is decode them! Each message consists of three words, and the three messages are unrelated. The encoding used is different for each message. Here are the messages:

KSAD LZW QSUZL
TCZZCK AS VCAS
ZPTWSL ZPTVU ZHFZ

The prizes this month are five of the new slimline bar code reader economy packs, produced by PMF Designs in conjunction with the Council for Educational Technology. With the bar code reader you can read in listings in bar code format, and dump bar codes to a printer. And it's simple to do. Thousands of these pen-like devices have already been sold to schools. The reader simply plugs into the BBC micro's User Port and the supporting software is loaded in.

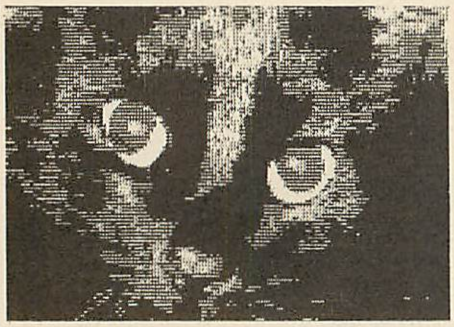
Each of these packs normally costs £29.95 and the first five correct sets of messages drawn out of the *Acorn User* hat after the closing date for receipt of entries will win a bar code reader.

Once you have decoded the messages, write all three on the back of a postcard and send it to: November Competition, Acorn User, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. The closing date for the competition is November 12 1986.

All winners will be notified by post and their names printed in a future issue of *Acorn User*.

ACORN USER OFFERS

UserDump – Acorn User's printer control ROM – £19.95



Dump graphics screens with UserDump

UserDump includes a ROM chip which plugs into any free sideways ROM socket on your BBC micro, and an easy-to-follow manual.

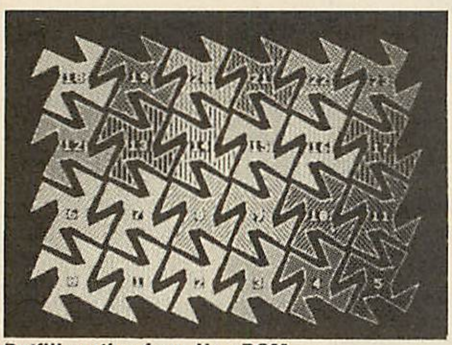
With the *UserDump* ROM installed you'll have access to a wide range of commands to help you control your printer's facilities – all for just £19.95.

You will be able to dump any screen image in any display mode by entering a single command – either as a line of your program or alternatively by typing in direct from the keyboard. *UserDump* will also give a perfect dump while a machine code program is running.

This versatile ROM will work with all the popular dot-matrix printers, including all those with single and double density bit-image graphics.

Send an A4 SAE to Seran at Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF, for details.

UserROM – Acorn User on a chip only £19.95



Dotfill routine from UserROM

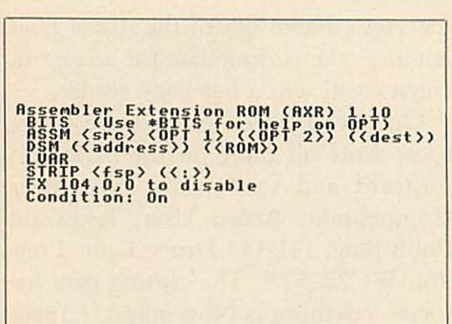
The *Acorn User UserROM* brings the best of *Acorn User* into your micro. Put together by our technical editor, Bruce Smith, this 8k ROM chip is packed with your favourite *Acorn User* routines. Simply plug the ROM chip into a sideways ROM socket and all the routines are instantly accessible via easy-to-use *commands – what could be simpler?

Routines include the popular colour fill and dot fill routines, bad program recovery, variable lister, function key lister, a graphics compiler, a circle drawing routine, sound compiler, plus lots, lots more!

Included with *UserROM* is a 22-page manual which explains how to get the most from your *UserROM*, and you'll find many demonstration programs showing how to use the new commands.

Full details available by sending an A4 SAE to Seran, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF.

Acorn User Assembler Extension ROM just £19.95!



AXR for machine code programmers

The *Acorn User Assembler Extension ROM (AXR)* is aimed at the machine code programmer. It is compatible with Basic versions 1 and 2 – a Master compatible version is in the pipeline – and it costs just £19.95.

The *AXR* extends the Basic assembler to allow a variety of assembly options and commands. Just some of the new facilities are outlined below.

- Bit 0 to 2 – Usual OPT functions
- Bit 3 set – Write to file and RAM
- Bit 4 set – Write to file only
- Bit 5 set – Branch to jump
- Bit 6 set – Enhanced error reporting
- Bit 7 set – Flag duplicate labels

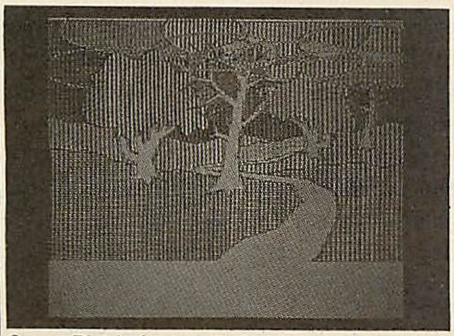
The *AXR* adds several new pseudo op codes to the assembler. These are: ORG – sets the origin for assembly; DST – specify destination; DFB – defines a byte; DFW – define word; DFD – define double word; DFR – define string; SWR – set the sideways RAM number.

Telephone Orders 01-836 2441 9.30 am to 5.00 pm. Ask for Seran

PROGRAM LISTINGS

ACORN USER OFFERS

November listings on cassette £3.95 and disc £5.95

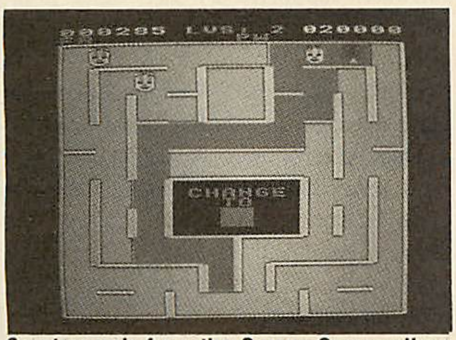


Super Plot is just one of our super programs

This month's listings feature some exciting offerings. There's Jonathan Baldwin's *Super Plot*, to experiment with 3D wire frame images on a plotter, and Peter Voke brings us screen switching – animation created by storing two screens in memory at once. There's also a scrabble scorer plus an icon design package with a calculator example and Tessie Revivis follows up with another article on simple assembler.

All the programs in this issue are on both the disc and cassette versions. The disc is fully menu driven and a good buy at only £5.95. Electron owners remember the disc is fully compatible with the Advanced Plus 4 disc interface with 5.25 inch disc drives. The graphics bonus this month is a screen drawn using the *Super Plot* program. The cassette versions for both the BBC micro and Electron contain a tape to disc transfer program – all for just £3.95. Your order form is on page 129.

Free offers with disc and cassette subscriptions!



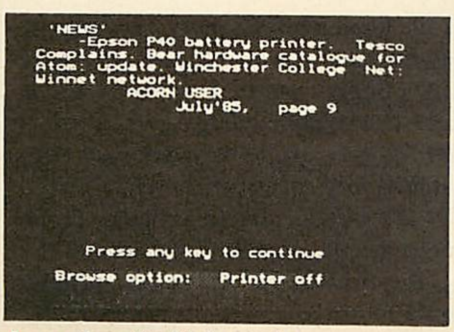
Spectramania from the Games Compendium

This month you can receive our superb quality disc binder worth £9.95 when you subscribe to our monthly listings disc. Made up in grey cloth, it includes six transparent inserts each capable of holding two 5.25 in discs and a protective slip case. Send £69 while this offer lasts. Overseas readers should add £7 for surface mail (and airmail to Europe), or £15 for airmail delivery (to the rest of the world).

Plus receive our new *Acorn User Games Compendium* cassette, free, when you subscribe to our monthly cassette listings, regularly delivered each month for £45.

The *Games Compendium* features some great entertainment for BBC micro, Master and Electron owners. It includes old favourites such as *Spectramania, Quadline, Picture Slide* and *3-D Maze*. You can also go collecting apples in *Shuggy's Garden*, or be all at sea in *Run Silent, Run Deep*. Order form on page 129.

Acorn User bibliography on disc from £7.95



A page from the Bibliography

If you've ever spent hours looking through your copies of *Acorn User* for an elusive article, which you know you've seen but can't remember when or where, then what you need is the *Acorn User* bibliography!

Our bibliography contains information on where to find games, listings, educational and utility programs; reviews of hardware, firmware, peripherals, software and books; and feature articles of specific and general interest. You'll even find reference to readers' letters! The *Acorn User* bibliography is sold in parts, in a specially enhanced format, to make your searches even faster, taking about 15 seconds on the 40-track and 40 seconds on the 80-track disc. Location of a reference is by one- or two-string searching and the user may specify the starting month and year.

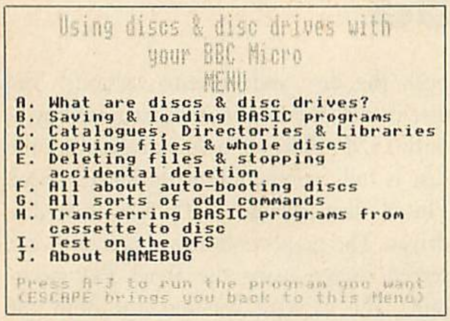
There are three parts currently available; part 4, will be released later in the year. Order form on page 129.

Telephone Orders 01-836 2441 9.30 to 5.00pm. Ask for Seran – Order form on page 129

SPECIAL PROGRAMS

ACORN USER OFFERS

Get out of trouble with the Disc Help Disc – only £6.95



The *Disc Help Disc*'s menu page

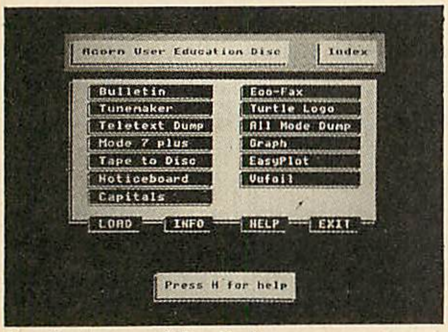
Have you just bought a disc interface or disc drive? Do you have a disc interface and drive but are bamboozeled by all the jargon? Do you simply want to know all about discs and how to use your Disc Filing System ROM to its full potential?

If you answer yes to any of these questions then *Acorn User* has the answer in the form of the *Disc Help Disc*, specially developed for the magazine by the North and Mid-Essex BBC Users Group.

Simply insert the *Disc Help Disc* into your drive and all the information you will ever need is at your fingertips. All aspects of file maintenance are covered and a Disc Filing System simulator allows you to practise use of the commands.

A 'question and answer' tutorial at the end of each section ensures that you are able to evaluate your own knowledge. The disc is in 80-track format only. Order using the form on page 129.

Wise up with the Education Disc at just £7.95



***Eco-Fax* is one of the disc's programs**

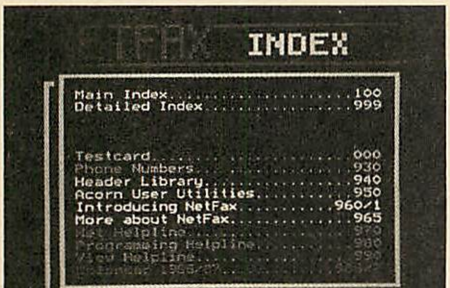
The *Education Disc* contains programs drawn from *Acorn User* magazine.

Eco-Fax is a sophisticated viewdata-type database for use on Econet systems, and comes with its own versatile frame editor. There is a colourful version of *Turtle Logo*; a program which shows equations as graphs; and a music writing program which allows you to edit tunes.

Graphics are a strong feature of the collection, including the *Easyplot* drawing software, supported by two other programs which use *Easyplot* screens as an electronic noticeboard or in place of an overhead projector. A bulletin board displays messages in scrolling characters.

There are routines to use in your own Basic programs – screen dumps, a machine code utility and graphics plotting and drawing commands in mode 7. The disc is available in 40 track format only. Order form on page 129.

Network Utility Disc only £19.95



Bring teletext information to networks

The *Acorn User Network Utility Disc* is the logical addition to your network, combining a wide range of invaluable routines with a sophisticated, yet easy-to-use teletext information system. The disc features:

- NetFax – our hybird information system, provides thousands of pages of information which may be read without affecting any text or program in memory. It features an advanced teletex editor.
- Utilities for all network users, including a file locator and directory size finder.
- Utilities for network managers, including a bridge-compatible screen viewer and an efficient 'notify-all' facility.
- An auto-installer to transfer all of our utilities to your net painlessly.
- 150 NetFax pages, including instructions, help pages and sample indexes.

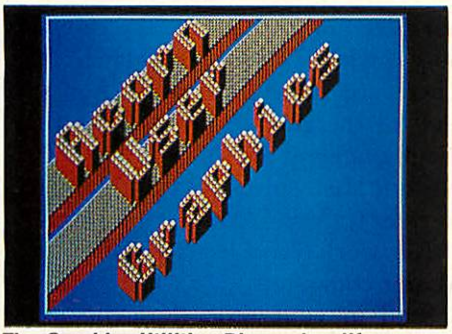
The *Acorn User Utility* disc is in 80-track format and costs just £19.95. See page 129 for your order form.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran. Order form on page 129

SPECIAL PROGRAMS

ACORN USER OFFERS

Graphics Utilities Disc a bargain at £7.95



The *Graphics Utilities Disc* makes life easy

The *Graphics Utilities Disc* is divided into three easy to use sections.

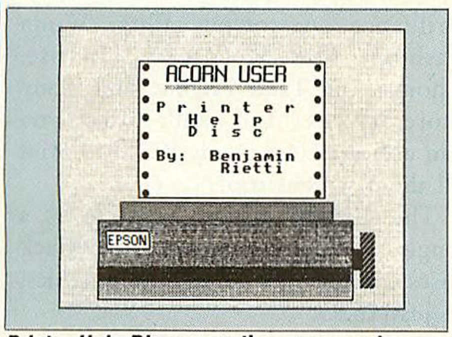
The Basic procedure library includes multi-height text, shape drawing and screen rotation.

The sprites section designed as a fully integrated package includes: sprite designer, editor, mover, wipe collision detection and levels.

The third section contains an assortment of useful one-off machine code utilities, which perform specific functions such as mode conversion routines, colour filling routines, block graphics, move and copy routines, block rotation and reflection routines.

This disc is only available in 40-track format, but includes an 80-track transfer program. Order form on page 129. Note that *Acorn User* retains the right to alter the contents of this disc without obligation.

Acorn User's comprehensive Printer Help Disc at £7.95



Printer Help Disc: more than a manual

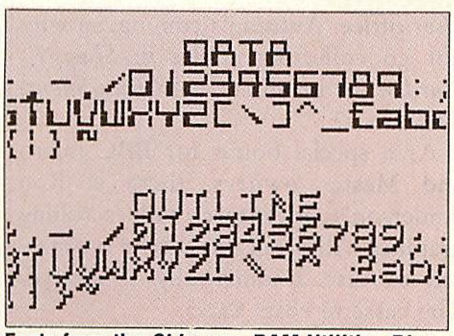
Designed and written by Benjamin Rietti, the programs and tutorials on this disc will help you to understand your printer's facilities.

Printer manuals often don't fully cover the needs of Master and BBC micro series owners – our printer help disc will! It includes what to look for in a printer, controlling type styles, using *Wordwise* and *View*, screen images, printer care, an ASCII codes table. Plus diagrams to help when things go wrong.

It is available in 40 and 80 track format, and is compatible with the BBC models B, B+ and Master 128.

It is designed to be used with Epson compatible printers. For more printer details please send a stamped addressed envelope to Seran, Redwood Publishing 141-143 Drury Lane, London WC2B 5TF.

Acorn User's Sideways RAM Utilities Disc £9.95



Fonts from the *Sideways RAM Utilities Disc*

What could be more helpful than our new *Sideways RAM Utilities Disc*?

Available in 40 track format with a transfer program for 80 track users, the disc includes:

- Standard header – tack on your own assembly language programs to form into a sideways RAM image.
- ROM filing system formatter – a program allowing your own programs to be formatted.
- Windows – pulls down windows for graphics and text.
- Printer buffer – leave documents to print while using the computer.
- *RLOOK and *ROMS look into sideways RAM memory locations and list the ROMs present.

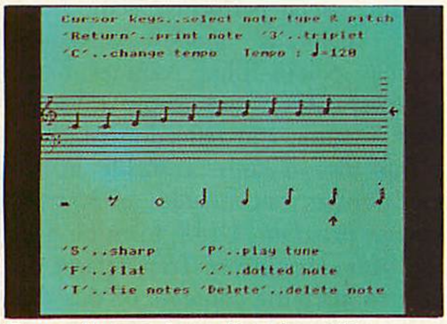
Plus lots, lots more. Order form on page 129. Note: *Acorn User* retains the right to alter the contents of this disc without obligation.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran – Order form on page 130

SPECIAL PROGRAMS

ACORN USER OFFERS

Acorn User Finest Favourites – just £3.95



***Tunemaker*: an *Acorn User* favourite**

Following the popularity of the *Best of Acorn User Cassette*, we introduce our new favourites selection.

Don't miss captivating curves with *Lisajous Figures* (Nov 85). Use our *Screen Fonts* (Dec 85) to anotate charts and diagrams.

And why not save those graphics screens in less space with the *Screen Compression* program (Dec 85).

Cheat at the popular game *Elite* with our *Elite Editor* (Feb 86). Try entering music with *Tunemaker* (March 86). There are *Basic Extensions* (Apr 86) and for the graphics treat of the year the *Mandlebrot Set* (May 86). And last but not least, solve word puzzles with *Puzzles* (July 86).

All work on Electron, BBC and Master computers.

Send in your order form on page 130 now and start having some fun!

Acorn User Gallery disc – super graphics for only £6.95



Hancock puts in an appearance on the disc

The *Acorn User Gallery* disc has proved to be immensely popular since its introduction in August. It features an automatic scrolling display of over 20 stunning graphic screens.

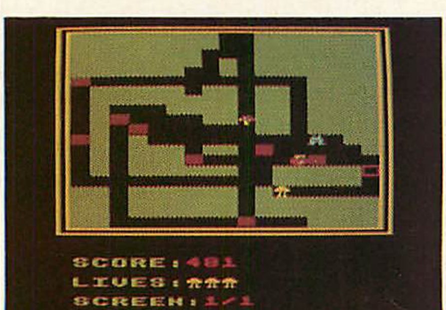
What's more, the disc gives you the chance to dabble with a little creativity, by using the *Super Painter* and *Pixel Editor* software.

You can marvel at Spiderman, see the Coke can come alive, plus Robotic Brilliance, Astronaut, Elite, Wimp Fashion, Max Headroom, Sunrise, Thomas the Tank Engine, and many more screens. And don't forget you can use our *User-Dump* ROM to print all these screens too!

The Gallery disc is available as a single 80-track disc or two 40-track discs containing over 400k of graphics, at just £6.95.

Order form on page 129.

Again this month! Acorn User's Games Compendium Cassette – £3.95



***Shuggy's Garden* from the compendium**

The Acorn User Games Compendium brings the best games published in *AU* over the past two years to BBC micro, Master and Electron owners. Included are David Acton's blockbuster *Spectramania* and the popular *Quadline*. Puzzle fanatics will get great enjoyment from our *Picture Slide* game while many will be amazed at Dave Lawrence's *3-D Maze*. Adventurers can sample the delights of the *Acorn User* office. Autumn's coming, so why not go collecting apples in *Shuggy's Garden*, or be all at sea in *Run Silent, Run Deep*?

As a special bonus for BBC micro and Master owners, there is Rob Anderson's adventure with scrolling graphics. All programs can be transferred to disc automatically if desired. The cassette costs £3.95.

See page 130 for order form.

Telephone Orders 01-836 2441 9.30am to 5.00pm. Ask for Seran. Order form on page 129

YELLOW PAGES

INDEX/COMPATIBILITY

Entering listings

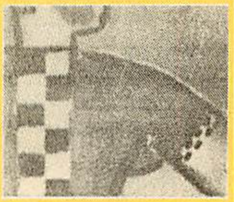
To make the task of entering listings easier, *Acorn User* has adopted several standards in the Yellow Pages. Programs are listed with line numbers in increments of 10, so type AUTO <Return> for automatic line numbering before you start. Before you list what you've entered, type LISTO 1 <Return> to provide spaces after theline numbers. Programs in the Yellow Pages are often listed to a width of 40 characters, so type MODE 6 <Return> before you start. Comparing the line-endings of your listing with the Yellow Pages will help you spot extra or missing characters.

To make sure that the program you want to enter will work on your particular machine, check the index below. All the listings work with Basic 1,2 and 4 (unless stated otherwise) and with operating system OS1.2 or above. If a program is accompanied by an article, please read the article first. If special care is needed when entering, we provide a 'How to Enter' box.

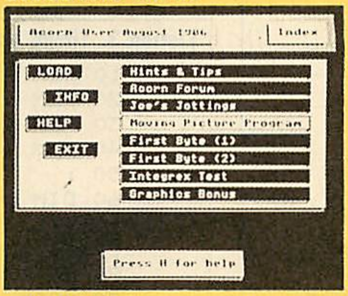
Once you've typed in your program, save it to tape or disc then test it by running it. If you've made a mistake, an error message will appear, telling you which line contains the error. List the line and check it. If the line is the start of a procedure definition the error may be a line which calls the procedure.







DISCS AND TAPES



All the listings on these pages can be found on this month's listings disc or cassette. See page 109 for details.

BACK ISSUES





For help with entering and debugging listings see the following back issues: April '86, June '85, Aug '84, Sept '83.

Program		BBC B	BBC B+/ 128K	BBC with ADFS	Shadow RAM	Electron	Electron with Plus 1	Electron with Plus 1 & Plus	Master 128	Master 128 + ADFS	Master Compact	6502SP	Econet	Monthly tape & disc
Hints & Tips	Listing 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Listing 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Listing 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Joe's Calculator	Listing 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Switching Screens	Listing 1	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	Y	Y
	Listing 2	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	Y	Y
	Listing 3	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	Y	Y
Super Plot	Listing 1	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	Y	Y(a)
	Listing 2	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	Y	Y(a)
	Listing 3	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	Y	Y(a)
Printer Benchmarks	Listing 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(b)
	Listing 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(b)
	Listing 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(b)

(a) Electron users should refer to the 'How to enter' box on page
(b) Electron users require Plus 1 6502. Second Processor users should set PAGE to &1900 before running listing 1
Y = Yes N = No

See Hints & Tips, page 49

Listing 1. Prints zig zag type graphics

```
   10 REM Hints & Tips - listing 1
   20 REM by C MacDonald
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User November 1986
   50 :
   60 REPEAT
   70 MODE 1
   80 VDU 19,3,4,0,0,0
   90 COLOUR 2
  100 *FX 15
  110 PRINT"Enter a number between 1 and
 9: ";
  120 REPEAT
  130 D%=GET
  140 UNTIL D%>48 AND D%<58
  150 PRINT;D%-48
  160 D%=(D%-48)*4
  170 Y%=750:X%=-(60+D%*14)
  180 C%=750:E%=4
  190 colour=1:REPEAT
  200 GCOL 3,colour
  210 FOR I%=0 TO 7
  220 PLOT 69,X%+(8+D%*2)*I%,Y%-(12+D%*2
)*I%
  230 NEXT I%
  240 X%=X%+4
  250 Y%=Y%+E%
  260 IF Y%>(C%+D%) OR Y%<(C%-D%) THEN E
%=-E%
  270 IF X%>1280 THEN X%=-(60+D%*15)-4*R
ND(D%):colour=RND(3)
  280 UNTIL INKEY(-99)
  290 UNTIL FALSE
```

Listing 2. The Scrabble Scorer

```
   10 REM Hints & Tips - listing 2
   20 REM by Bernard Emblem
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User November 1986
   50 :
   60 DIM player$(9),score%(9),total%(9)
   70 ON ERROR RUN
   80 MODE 6
   90 VDU 19,0,4
  100 *FX 11,0
  110 bored=FALSE
  120 PROCinputplayers
  130 CLS
  140 REPEAT
  150 PROCscore
  160 UNTIL bored
  170 END
  180 :
  190 DEF PROCinputplayers
  200 REPEAT
  210 REPEAT
  220 CLS
  230 PRINT'
  240 PROCcentre("ACORN USER SCOREKEEPER
",2)
  250 INPUTTAB(1,4)"How many players/tea
ms? "players
  260 IF players>9 PRINT'"Sorry, nine's
the maximum":aa=INKEY(200)
  270 UNTIL players>0 AND players<10
  280 FOR X=1 TO players
  290 PRINT'" Player ";X;:INPUTplayer$(X
```

Continued ▶

◀ Martin Phillips' listing 2 continued

```
  300 NEXT X
  310 PRINT'" This OK (Y/N)? ";
  320 ok$=GET$
  330 UNTIL ok$="y" OR ok$="Y"
  340 ENDPROC
  350 :
  360 DEF PROCscore
  370 PROCcentre("ACORN USER SCOREKEEPER
",1)
  380 PRINTTAB(1,3)"Latest Score:"
  390 PRINTTAB(1,13)"Total Scores:"
  400 FOR X%=1 TO players
  410 L%=LEN(player$(X%))
  420 blank$=STRING$(39," ")
  430 PRINTTAB(1,X%+3);blank$
  440 PRINTTAB(20-L%,X%+3);player$(X%);
  450 INPUT" "score%(X%)
  460 total%(X%)=total%(X%)+score%(X%)
  470 PRINTTAB(1,X%+13);blank$
  480 PRINTTAB(20-L%,X%+13);player$(X%);
  490 PRINTTAB(20,X%+13)total%(X%)
  500 NEXT X%
  510 PROCcentre("Press Escape to start
another game",23)
  520 ENDPROC
  530 :
  540 DEF PROCcentre(A$,A%)
  550 L%=LEN(A$)
  560 PRINTTAB(20-L%/2,A%)A$
  570 ENDPROC
```

Listing 3. Timed scoring system

```
   10 REM Hints & Tips - listing 3
   20 REM by Bernard Emblem
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User November 1986
   50 :
   60 DIM player$(9),score%(9),total%(9)
,sort(9)
   70 topscore=-1
   80 ON ERROR RUN
   90 MODE 6
  100 VDU 19,0,4,0,0,0
  110 *FX 11,0
  120 bored=FALSE
  130 PROCinputplayers
  140 CLS
  150 REPEAT
  160 PROCscores
  170 UNTIL bored
  180 END
  190 :
  200 DEF PROCinputplayers
  210 REPEAT
  220 REPEAT
  230 CLS
  240 PROCcentre("ACORN USER SCOREKEEPER
",2)
  250 INPUTTAB(1,4)"How many players/tea
ms? "players
  260 IF players>9 PRINT'"Sorry, nine's
the maximum":aa=INKEY(200)
  270 UNTIL players>0 AND players<10
  280 FOR X%=1 TO players
  290 PRINT'" Player ";X%;:INPUTplayer$(
X%)
  300 NEXT X%
  310 PRINT'" This OK (Y/N)? ";
  320 ok$=GET$
```

Continued ▶

See Joe's cool calculator, page 81

◀ Martin Phillips' Listing 3 continued

```
  330 UNTIL ok$="y" OR ok$="Y"
  340 INPUT'"Maximum time allowed (secs)
 "maxtime:maxtime=maxtime*100
  350 ENDPROC
  360 :
  370 DEF PROCscores
  380 PROCcentre("ACORN USER SCOREKEEPER
",1)
  390 PRINTTAB(1,3)"Latest score:"
  400 PRINTTAB(1,13)"total scores:"
  410 FOR X%=1 TO players
  420 L%=LEN(player$(X%))
  430 blank$=STRING$(39," ")
  440 PRINTTAB(1,X%+3);blank$
  450 PRINTTAB(20-L%,X%+3);player$(X%);
  460 PROCtime
  470 IF score%(X%)>topscore THEN topsco
re=score%(X%):top$=player$(X%)
  480 total%(X%)=total%(X%)+score%(X%)
  490 PROCsort
  500 FOR N%=1 TO players
  510 L%=LEN(player$(sort(N%)))
  520 PRINTTAB(1,N%+13);blank$
  530 PRINTTAB(20-L%,N%+13);player$(sort
(N%));
  540 PRINTTAB(21,N%+13);total%(sort(N%)
)
  550 NEXT N%:NEXT X%
  560 PRINTTAB(0,23)blank$:PROCcentre("B
est single score is "+STR$topscore+" by
"+top$,23)
  570 ENDPROC
  580 :
  590 DEF PROCcentre(A$,A%)
  600 L%=LEN(A$)
  610 PRINTTAB(20-L%/2,A%)A$
  620 ENDPROC
  630 :
  640 DEF PROCsort
  650 N%=1:s$=" "
  660 REPEAT
  670 total=-100
  680 FOR I%=1 TO players
  690 IF INSTR(s$,STR$(I%))>0 THEN GOTO7
10
  700 IF total%(I%)>total THEN total=tot
al%(I%):sort(N%)=I%
  710 NEXT I%
  720 s$=s$+STR$(sort(N%))
  730 N%=N%+1
  740 UNTIL N%>players
  750 ENDPROC
  760 :
  770 DEF PROCtime
  780 TIME=0:A%=0
  790 PRINT" ";
  800 REPEAT
  810 b$=INKEY$(100)
  820 UNTIL (b$>="0" AND b$<="9") OR TIM
E>maxtime
  830 IF b$="" THEN score%(X%)=0:VDU7,48
:ENDPROC
  840 score$=b$:PRINT b$;
  850 REPEAT
  860 REPEAT
  870 b$=GET$
  880 UNTIL b$>="0" AND b$<="9" OR b$=CH
R$13
  890 score$=score$+b$:PRINT b$;
  900 UNTIL b$=CHR$(13)
  910 score%(X%)=VAL(score$)
  920 ENDPROC
```

Listing 1. The Acorn User calculator

```
   10 REM Desktop Calculator
   20 REM by Joe Telford
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User November 1986
   50 :
   60 @%=&0100090A
   70 mode=4:MODE mode
   80 PROCsetup
   90 ON ERROR PROCerr
  100 REPEAT
  110 off=FALSE
  120 REPEAT
  130 PROCmoveptr
  140 UNTIL INKEY-74
  150 IF cflag=0 AND px%>128 AND px%<196
 AND py%>956 mode=(3-(mode-1))+1:MODE mo
de:PROCca:PROCsetup:UNTIL 0
  160 IF cflag=0 AND px%>64 AND px%<132
AND py%>956 vflag=1:PROCvolume:MOVE px%,
py%:PRINTc$:UNTIL 0
  170 IF cflag=0 AND px%<68 AND py%>956
PROCcopyright(cx,cy):cflag=1:UNTIL 0
  180 IF cflag=0 AND px%>sx+20 AND py%>s
y AND px%<sx+500 PROCdecode
  190 IF cflag=1 AND px%>cx+305 AND px%<
cx+385 AND py%>cy+96 AND py%<cy+160 PROC
scrubcopy(cx,cy):cflag=0:UNTIL 0
  200 UNTIL off=TRUE
  210 COLOUR 128
  220 COLOUR 7
  230 CLS:PRINT:VDU4
  240 *FX 4,0
  250 *FX 12,0
  260 *BASIC
  270 END
  280 :
  290 DEF PROCsetup
  300 zone%=@%:cflag=0:cx=8:cy=500
  310 vol=1:vflag=0:dpflag=0
  320 eqflag=0:mem$="0":opflag=0
  330 sx=700:sy=200:acc$="0":op$=""
  340 py%=512:px%=640
  350 VDU 4
  360 COLOUR 1
  370 COLOUR 128
  380 CLS
  390 PROCcalcchars
  400 VDU 19,1,0;0;
  410 VDU 19,2,0;0;
  420 VDU 19,3,0;0;
  430 IF mode=1 GCOL 0,130:CLG:GCOL 0,12
0
  440 PROCdesk:VDU 5
  450 PROCcalc(sx,sy)
  460 PROCdisp
  470 IF mode=1 VDU 19,1,1;0;19,3,7;0;19
,2,4;0; ELSE VDU 19,1,7;0;
  480 GCOL 4,0
  490 *FX 4,1
  500 *FX 12,3
  510 *FX 11,5
  520 ENDPROC
  530 :
  540 DEF PROCerr
  550 IF ERR=18 dac$="  Division by 0":P
ROCdodisplay:acc$="0":op$="":ENDPROC
  560 IF ERR=25 SOUND 1,vol*-15,148,2:mo
de=4:dac$="Not enough room":PROCdodispla
y:acc$="0":op$="":ENDPROC
  570 *FX 12 0
  580 REPORT:PRINT" at ";ERL
```

Continued ▶

◀ **Joe's listing 1 continued**

```
 590 END
 600 :
 610 DEF PROCdecode
 620 k=INT((px%-sx-22)/120)+INT((554+sy
-py%)/90)*4
 630 IF k>23 OR k<0 ENDPROC
 640 SOUND 1,vol*-15,148,2
 650 PROCi
 660 IF k=0 PROCcm
 670 IF k=1 PROCcl
 680 IF k=2 PROCca
 690 IF k=3 off=TRUE
 700 IF k=4 PROCrm
 710 IF k=5 PROCsm
 720 IF k=6 PROCpercent
 730 IF k=7 PROCplusmin
 740 IF k=8 OR k=9 OR k=10 PROCenter(ST
R$(k-1))
 750 IF k=12 OR k=13 OR k=14 PROCenter(
STR$(k-8))
 760 IF k=16 OR k=17 OR k=18 PROCenter(
STR$(k-15))
 770 IF k=20 PROCenter("0")
 780 IF k=21 PROCenter(".")
 790 IF k=11 PROCop("*")
 800 IF k=15 PROCop("/")
 810 IF k=19 PROCop("-")
 820 IF k=22 PROCop("+")
 830 IF k=23 PROCequals
 840 ENDPROC
 850 :
 860 DEF PROCdisp
 870 IF acc$="" acc$="0"
 880 dac$=""
 890 FOR loop%=1 TO LEN(acc$)
 900 dac$=dac$+MID$(dig$,INSTR(nos$,MID
$(acc$,loop%,1)),1)
 910 NEXT
 920 PROCdodisplay
 930 ENDPROC
 940 :
 950 DEF PROCdodisplay
 960 VDU 5
 970 GCOL 0,0
 980 PROCrect(sx+24,sy+612,496,64,1)
 990 GCOL 4,0
1000 MOVE acx+32*(15-LENdac$),acy
1010 PRINT dac$
1020 IF VAL(mem$)=0 GCOL 0,1 ELSE GCOL
0,0
1030 MOVE acx+32,acy-64
1040 PRINT"*"
1050 GCOL 4,0
1060 ENDPROC
1070 :
1080 DEF PROCcm
1090 mem$="0":PROCdisp
1100 ENDPROC
1110 :
1120 DEF PROCcl
1130 acc$="0":PROCdisp:dpflag=0
1140 ENDPROC
1150 :
1160 DEF PROCca
1170 acc$="0":op$="":PROCdisp:dpflag=0
1180 ENDPROC
1190 :
1200 DEF PROCrm
1210 acc$=mem$:dpflag=0
1220 IF INSTR(acc$,".")>0 dpflag=1
1230 PROCdisp
```

Continued ▶

◀ **Joe's listing 1 continued**

```
1240 ENDPROC
1250 :
1260 DEF PROCsm
1270 mem$=acc$:PROCdisp
1280 ENDPROC
1290 :
1300 DEF PROCpercent
1310 IF op$="" OR INSTR("*+/-",RIGHT$(o
p$,1))<1 op$=acc$+"/100"
1320 IF RIGHT$(op$,1)="*" op$=op$+acc$+
"/100"
1330 IF RIGHT$(op$,1)="/" op$="("+op$+a
cc$+")*100"
1340 IF RIGHT$(op$,1)="+" op$=op$+"(("+
op$+"0)*"+acc$+"/100)"
1350 IF RIGHT$(op$,1)="-" op$=op$+"(("+
op$+"0)*"+acc$+"/100)"
1360 acc=EVAL(op$)
1370 IF ABS(acc)>0.000000009 AND ABS(ac
c)<0.1 PROCsetzone(ABS(acc))
1380 acc$=STR$acc
1390 PROCdisp:op$="":eqflag=1:@%=zone%
1400 ENDPROC
1410 :
1420 DEF PROCplusmin
1430 IF LEFT$(acc$,1)="-" acc$=MID$(acc
$,2,LENacc$):PROCdisp:ENDPROC
1440 acc$="-"+acc$:PROCdisp:ENDPROC
1450 ENDPROC
1460 :
1470 DEF PROCop(s$)
1480 dpflag=0
1490 IF INSTR("*+/-",RIGHT$(op$,1))<1 o
p$=acc$+s$:acc$="0":opflag=1:ENDPROC
1500 IF opflag=1 op$=LEFT$(op$,LEN(op$)
-1)+s$:ENDPROC
1510 acc=EVAL(op$+acc$)
1520 IF ABS(acc)>0.000000009 AND ABS(ac
c)<0.1 PROCsetzone(ABS(acc))
1530 acc$=STR$acc
1540 PROCdisp:op$=acc$+s$:acc$="0"
1550 @%=zone%
1560 ENDPROC
1570 :
1580 DEF PROCsetzone(x)
1590 LOCAL loop%,places%
1600 @%=&0102090A
1610 FOR loop%=LEN(STR$(x)) TO 1 STEP-1
1620 IF MID$(STR$x,loop%,1)<>"0" places
%=loop%:loop%=1
1630 NEXT
1640 IF places%=LEN(STR$(x)):ENDPROC
1650 @%=&01020000+(places%-2)*&100+&0A
1660 ENDPROC
1670 :
1680 DEF PROCequals
1690 acc=EVAL(op$+acc$):dpflag=0
1700 IF ABS(acc)>0.000000009 AND ABS(ac
c)<0.1 PROCsetzone(ABS(acc))
1710 acc$=STR$(acc)
1720 PROCdisp:op$="":eqflag=1:@%=zone%
1730 ENDPROC
1740 :
1750 DEF PROCenter(x$)
1760 IF dpflag=1 AND x$="." THEN ENDPRO
C
1770 IF dpflag=0 AND (LEFT$(acc$,2)="-0
" OR LEFT$(acc$,1)="0") AND x$="0" THEN
x$=""
1780 IF eqflag=1 acc$="0":eqflag=0
```

Continued ▶

◀ **Joe's listing 1 continued**

```
1790 IF LENacc$=13 AND LEFT$(acc$,1)<>"
-" THEN ENDPROC
1800 IF LENacc$=14 AND LEFT$(acc$,1)="-
" THEN ENDPROC
1810 IF x$="." THEN dpflag=1
1820 IF acc$="-0" AND x$<>"." THEN acc$
="-"+x$:PROCdisp:opflag=0:ENDPROC
1830 IF acc$="0" AND x$="." THEN acc$=a
cc$+x$:PROCdisp:opflag=0:ENDPROC
1840 IF acc$="0" THEN acc$=x$ ELSE acc$
=acc$+x$
1850 PROCdisp:opflag=0
1860 ENDPROC
1870 :
1880 DEF PROCi
1890 GCOL 4,0
1900 PROCrect(sx+54+(k MOD 4)*120,sy+49
6-(k DIV 4)*90,72,48,1)
1910 REPEAT UNTIL INKEY$(5)=""
1920 PROCrect(sx+54+(k MOD 4)*120,sy+49
6-(k DIV 4)*90,72,48,1)
1930 ENDPROC
1940 :
1950 DEF PROCmoveptr
1960 MOVE px%,py%
1970 IF INKEY-58 AND py%<1024 PRINTc$:p
y%=py%+8:MOVE px%,py%:PRINTc$:MOVE px%,p
y%
1980 IF INKEY-42 AND py%>32 PRINTc$:py%
=py%-8:MOVE px%,py%:PRINTc$:MOVE px%,py%
1990 IF INKEY-122 AND px%<1250 PRINTc$:
px%=px%+8:MOVE px%,py%:PRINTc$:MOVE px%,
py%
2000 IF INKEY-26 AND px%>0 PRINTc$:px%=
px%-8:MOVE px%,py%:PRINTc$:MOVE px%,py%
2010 ENDPROC
2020 :
2030 DEF PROCcopyright(x,y)
2040 SOUND 1,-15*vol,148,2
2050 GCOL 0,1
2060 PROCrect(x+16,y-16,666,312,0)
2070 PROCrect(x,y,666,312,1)
2080 GCOL 0,0
2090 MOVE x+16,y+288
2100 PRINT" Desktop Calculator"
2110 MOVE x+16,y+224
2120 PRINT"Joe Telford    c.1986"
2130 MOVE x+16,y+64
2140 PRINT" Press this button."
2150 PROCbutton("ok",cx+305,cy+96)
2160 GCOL 4,0
2170 ENDPROC
2180 :
2190 DEF PROCscrubcopy(x,y)
2200 SOUND 1,-15*vol,148,2
2210 GCOL 0,2
2220 PROCrect(x,y-16,682,328,1)
2230 MOVE px%,py%
2240 GCOL 4,0
2250 PRINT c$
2260 ENDPROC
2270 :
2280 DEF PROCcalc(x,y)
2290 acx=x+36:acy=y+654
2300 VDU 23,147,0,24,0,255,0,24,0,0
2310 RESTORE
2320 GCOL 0,1
2330 PROCrect(x+16,y-16,544,726,0)
2340 PROCrect(x,y,544,726,1)
2350 GCOL 4,0
2360 PROCrect(x+8,y+596,528,96,0)
```

Continued ▶

◀ **Joe's listing 1 continued**

```
2370 GCOL 0,0
2380 FOR loop%=x+16 TO x+496 STEP 32
2390 PROCrect(loop%,y+604,32,80,0)
2400 NEXT
2410 GCOL 0,0
2420 PROCrect(x+16,y+604,512,80,0)
2430 GCOL 0,0
2440 PROCrect(x+24,y+612,496,64,1)
2450 FOR row=0 TO 5:FOR key=0 TO 3
2460 READ x$
2470 PROCbutton(x$,x+54+key*120,y+496-r
ow*90)
2480 NEXT:NEXT
2490 ENDPROC
2500 :
2510 DEF PROCdesk
2520 VDU 23,128,51,204,51,204,51,204,51
,204
2530 VDU 23,129,3,7,7,15,15,15,0,31
2540 VDU 23,130,192,224,224,240,240,240
,0,248
2550 VDU 23,131,31,31,31,15,7,60,127,0
2560 VDU 23,132,248,248,248,240,192,0,2
40,0
2570 COLOUR 129:PRINTSTRING$(80," ");
2580 COLOUR 0:COLOUR 129
2590 PRINT TAB(0,0);
2600 VDU 129,130,8,8,10,131,132
2610 COLOUR 1:COLOUR 128
2620 VDU 23,129,192,240,108,80,40,36,2,
1
2630 c$=CHR$129:GCOL0,0
2640 PROCrect(132,968,64,48,0)
2650 MOVE 148,1008:VDU 5
2660 PRINT;mode
2670 PROCvolume
2680 ENDPROC
2690 :
2700 DEF PROCbutton(x$,x,y)
2710 GCOL 0,0
2720 PROCrect(x,y,72,48,1)
2730 PROCrect(x-8,y-8,88,64,0)
2740 GCOL 0,3
2750 MOVE x+(72-LENx$*32)/2,y+36
2760 IF x$="/" VDU 147 ELSE PRINT x$
2770 ENDPROC
2780 :
2790 DEF PROCrect(x,y,l,w,f)
2800 MOVE x,y
2810 IF f=0 DRAW x+l,y:DRAW x+l,y+w:DRA
W x,y+w:DRAW x,y:ENDPROC
2820 MOVE x+l,y:PLOT 85,x,y+w-4
2830 MOVE x,y+w-4:MOVE x+l,y
2840 PLOT 85,x+l,y+w-4:MOVE x,y
2850 ENDPROC
2860 :
2870 DEF PROCvolume
2880 VDU 23,133,0,3,7,15,15,15,15,15
2890 VDU 23,134,0,192,224,240,240,240,2
40,240
2900 VDU 23,135,15,31,63,127,7,3,0,0
2910 VDU 23,136,240,248,252,254,224,192
,0,0
2920 VDU 23,137,0,3,4,8,8,8,8,8
2930 VDU 23,138,0,192,32,16,16,16,16,16
2940 VDU 23,139,8,16,32,127,2,1,0,0
2950 VDU 23,140,16,8,4,254,64,128,0,0
2960 IF vflag=1 THEN vol=1-vol
2970 SOUND 1,vol*-15,148,2
2980 GCOL 4,0
2990 MOVE px%,py%
```

Continued ▶

◀ Joe's listing 1 continued

```
3000 PRINT c$
3010 VDU 4
3020 COLOUR 129
3030 COLOUR 0
3040 PRINTTAB(2,0);
3050 IF vol=1 VDU 133,134,8,8,10,135,13
6
3060 IF vol=0 VDU 137,138,8,8,10,139,14
0
3070 VDU 5
3080 vflag=0
3090 COLOUR 1
3100 COLOUR 128
3110 REPEAT UNTIL INKEY$(5)=""
3120 ENDPROC
3130 :
3140 DEF PROCcalcchars
3150 VDU 23,148,63,33,33,33,33,33,63,0
3160 VDU 23,149,4,4,4,4,4,4,4,0
3170 VDU 23,150,63,1,1,63,32,32,63,0
3180 VDU 23,151,63,1,1,63,1,1,63,0
3190 VDU 23,152,33,33,33,63,1,1,1,0
3200 VDU 23,153,63,32,32,63,1,1,63,0
3210 VDU 23,154,63,32,32,63,33,33,63,0
3220 VDU 23,155,63,1,1,1,1,1,1,0
3230 VDU 23,156,63,33,33,63,33,33,63,0
3240 VDU 23,157,63,33,33,63,1,1,1,0
3250 VDU 23,158,63,32,32,63,32,32,63,0
3260 nos$=" 0123456789E.-"
3270 dig$=" "+CHR$148+CHR$149+CHR$150+C
HR$151+CHR$152+CHR$153+CHR$154+CHR$155+C
HR$156+CHR$157+CHR$158+".-"
3280 ENDPROC
3290 :
3300 DATA CM,CL,CA,OF,RM,SM,%,+-,7,8,9,
x,4,5,6,/,1,2,3,-,0,.,+,=
```

Answers to Joe's calculator word puzzles

1. 77345 (ShELL)
2. 3719 (bILE)
3. 14 (hI)
4. 9009 (bOOb)
5. 5616 (gIgS)
6. gOOSE (35006), 35006+330 = 35336 (gEESE)
7. 63 (Eg)
8. LIES (5317), 5317 − 999 = 4318
9. EEL (733) and LIZ (217)

How to enter SuperPlot

The Super Plot *graphics suite consists of three listings. Listing 1 assembles machine-code used by listings 2 and 3. The main* Super Plot *program is presented as listing 2, and listing 3 is a mode-converter which allows you to transport your* Super Plot *images to other graphics programs*

Before entering any of the listings, type:

**KEY10 PAGE=&2300!M NEW!M <Return>*

and press the Break key. This is necessary because all of the listings require PGE to be set at &2300. The area of memory from &1500 to &2300 is used for data-files and, for this reason, Super Plot *will not run on a BBC B or B+ using ADFS.*

Similarly, Super Plot *will not work on an Electron with Plus 3.*

To help you spot any typing errors you might make entering listing 1, a checksum routine has been included. If an error is detected, a message will be displayed. If not, the machine code will be saved as "CODE".

Listing 2 is the main Super Plot *program. Please read Jonathan's article very carefully before using* Super Plot. *It begins on page 87.*

Listing 3 is a mode-converter. Having designed and saved your Super Plot *images, use listing 3 to transport the pictures to other graphics packages. For example, to colour your images using* Super Painter *(*Acorn User *January 1986) enter 1 when prompted for the mode. Then enter the names of all the images you want included in your picture. Finally, press the Return key by itself and enter the name you want to give the final picture file. This file can be loaded into Super Painter.*

Super Plot on the Electron

Differences between the BBC micro and Electron keyboards will mean that Electron users will have to alter the following lines in listing 1.

```
 860 LDX #&EE
 930 LDX #&ED
1000 LDX #&EC
1070 LDX #&CB
1140 LDX #&DB
1210 LDX #&EA
5430 IF sum%=101761 PROCoscli("SAVE COD
E 1500+"+STR$~P%):ENDPROC
```

These changes should be made to listing 2.

```
 300 IF INKEY-19 PROCmir
 310 IF INKEY-20 PROCplus
 320 IF INKEY-53 PROCminus
 330 IF INKEY-37 PROCpt
 340 IF INKEY-22 PROCends
 380 UNTIL (in%>&FD OR INKEY-57 OR INKE
Y-40)
 400 IF INKEY-40 PROCsave:PROC1data:PRO
Cload ELSE PROCch
1350 IF INKEY-49 ic%=4:?speed%=0:VDU 7
1360 IF INKEY-50 ic%=12:?speed%=4:VDU 7
1370 IF INKEY-18 ic%=20:?speed%=8:VDU 7
5930 IF ERR=17 PROCesc("USE <COPY> TO E
XIT PROGRAM"):PROCtitle:ENDPROC
```

See A nice line in plotting, page 87

Listing 1. Assembles machine code in listings 2 & 3

```
 10 REM Transform Source
 20 REM by Jon Baldwin & Rod Smith
 30 REM for BBC B/B+/M/E
 40 REM (c) Acorn User November 1986
 50 :
 60 PROCass
 70 PROCcheck
 80 END
 90 :
100 DEF PROCass
110 DIM oscli% 40
120 osbyte=&FFF4:oswrch=&FFEE
```

Continued ▶

◀ Baldwin's listing 1 continued

```
130 at1=&70:at2=&72:at3=&74:at4=&76
140 bt1=&78:bt2=&7A:bt3=&7C:bt4=&7E
150 store=&80:ovflw=&81:flag=&82
160 temp%=&83:speed%=&84:count%=&85
170 type%=&1900:pnt%=&1A00
180 xi%=&1B00:xj%=&1C00
190 xl%=&1D00:xh%=&1E00
200 yi%=&1F00:yj%=&2000
210 yl%=&2100:yh%=&2200
220 FOR Q%=0 TO 3 STEP 3
230 P%=&1500
240 [OPT Q%
250 .draw
260 JSR init
270 JSR plot
280 RTS
290 BRK
300 :
310 .trans
320 JSR init
330 .keyprs
340 LDA #0
350 STA flag
360 LDA #&0F
370 JSR &FFF4
380 LDA #&79
390 LDX #&80
400 JSR &FFF4
410 CPX #0
420 BMI main
430 JMP end
440 .main
450 LDX #&9E
460 JSR scan
470 BNE notz
480 JSR zpress
490 .notz
500 LDX #&E6
510 JSR scan
520 BNE notl
530 LDA #&EF
540 STA store
550 LDA #&FF
560 STA ovflw
570 JSR hpress
580 .notl
590 LDX #&86
600 JSR scan
610 BNE notr
620 LDA #&10
630 STA store
640 LDA #0
650 STA ovflw
660 JSR hpress
670 .notr
680 LDX #&C6
690 JSR scan
700 BNE notu
710 LDA #&10
720 STA store
730 LDA #0
740 STA ovflw
750 JSR vpress
760 .notu
770 LDX #&D6
780 JSR scan
790 BNE notd
800 LDA #&EF
810 STA store
820 LDA #&FF
830 STA ovflw
840 JSR vpress
850 .notd
860 LDX #&9C
870 JSR scan
880 BNE notxred
890 JSR plot
900 JSR xred
910 JSR plot
920 .notxred
930 LDX #&EB
940 JSR scan
950 BNE notxmag
960 JSR plot
970 JSR xmag
980 JSR plot
990 .notxmag
1000 LDX #&BB
1010 JSR scan
1020 BNE notyred
1030 JSR plot
1040 JSR yred
1050 JSR plot
1060 .notyred
1070 LDX #&8A
1080 JSR scan
1090 BNE notymag
1100 JSR plot
1110 JSR ymag
1120 JSR plot
1130 .notymag
1140 LDX #&E9
1150 JSR scan
1160 BNE notmin
1170 JSR plot
1180 JSR min
1190 JSR plot
1200 .notmin
1210 LDX #&89
1220 JSR scan
1230 BNE notmax
1240 JSR plot
1250 JSR max
1260 JSR plot
1270 .notmax
1280 JMP keyprs
1290 .end
1300 RTS
1310 :
1320 .init
1330 LDA #0
1340 STA at1
1350 STA at2
1360 STA at3
1370 STA at4
1380 STA bt1
1390 STA bt2
1400 STA bt3
1410 STA bt4
1420 STA count%
1430 LDA #29
1440 JSR oswrch
1450 LDA #&80
1460 JSR oswrch
1470 LDA #2
1480 JSR oswrch
1490 LDA #0
1500 JSR oswrch
1510 LDA #2
1520 JSR oswrch
1530 RTS
1540 :
1550 .scan
1560 LDA #&81
1570 LDY #&FF
1580 JSR &FFF4
1590 CPX #&FF
1600 RTS
1610 .inc
1620 LDY count%
1630 INY
1640 STY count%
1650 CPY speed%
1660 RTS
1670 :
1680 .plot
1690 LDY #&FF
1700 LDA #0
1710 STA flag
1720 LDA type%,Y
1730 TAX
1740 INX
1750 .plotlp
1760 LDA #&19
1770 JSR oswrch
1780 INY
1790 LDA type%,Y
1800 JSR oswrch
1810 LDA pnt%,Y
1820 STY temp%
1830 TAY
1840 LDA xl%,Y
1850 JSR oswrch
1860 LDA xh%,Y
1870 JSR oswrch
1880 LDA yl%,Y
1890 JSR oswrch
1900 LDA yh%,Y
1910 JSR oswrch
1920 LDY temp%
1930 DEX
1940 BNE plotlp
1950 LDA #0
1960 STA count%
1970 RTS
1980 :
1990 .zpress
2000 JSR plot
2010 .zinc
2020 JSR rotate
2030 LDA #&FF
2040 STA flag
2050 JSR inc
2060 BMI zinc
2070 JSR plot
2080 LDX #&9E
2090 JSR scan
2100 BEQ zpress
2110 RTS
2120 :
2130 .rotate
2140 LDA #&FF
2150 TAY
2160 LDA type%,Y
2170 TAX
2180 INX
2190 .rotlp
2200 CLC
2210 INY
2220 LDA #0
2230 STA at4
2240 LDA xh%,Y
```

Continued ▶

◀ **Baldwin's listing 1 continued**

```
2250 STA at3
2260 BPL raaa
2270 LDA #&FF
2280 STA at4
2290 SEC
2300 .raaa
2310 LDA xl%,Y
2320 STA at2
2330 LDA xj%,Y
2340 STA at1
2350 ROR at3
2360 ROR at2
2370 ROR at1
2380 SEC
2390 LDA xi%,Y
2400 SBC at1
2410 STA at1
2420 LDA xj%,Y
2430 SBC at2
2440 STA at2
2450 LDA xl%,Y
2460 SBC at3
2470 STA at3
2480 LDA xh%,Y
2490 SBC at4
2500 STA at4
2510 LDA yh%,Y
2520 STA bt4
2530 LDA yl%,Y
2540 STA bt3
2550 LDA yj%,Y
2560 STA bt2
2570 LDA yi%,Y
2580 STA bt1
2590 JSR raab
2600 SEC
2610 LDA at1
2620 SBC bt1
2630 STA at1
2640 LDA at2
2650 SBC bt2
2660 STA at2
2670 LDA at3
2680 SBC bt3
2690 STA at3
2700 LDA at4
2710 SBC bt4
2720 STA at4
2730 LDA xh%,Y
2740 STA bt4
2750 LDA xl%,Y
2760 STA bt3
2770 LDA xj%,Y
2780 STA bt2
2790 LDA xi%,Y
2800 STA bt1
2810 JSR raab
2820 LDA at4
2830 STA xh%,Y
2840 LDA at3
2850 STA xl%,Y
2860 LDA at2
2870 STA xj%,Y
2880 LDA at1
2890 STA xi%,Y
2900 CLC
2910 LDA #0
2920 STA at4
2930 LDA yh%,Y
2940 STA at3
2950 BPL raae
2960 LDA #&FF
2970 STA at4
2980 SEC
2990 .raae
3000 LDA yl%,Y
3010 STA at2
3020 LDA yj%,Y
3030 STA at1
3040 ROR at3
3050 ROR at2
3060 ROR at1
3070 SEC
3080 LDA yi%,Y
3090 SBC at1
3100 STA at1
3110 LDA yj%,Y
3120 SBC at2
3130 STA at2
3140 LDA yl%,Y
3150 SBC at3
3160 STA at3
3170 LDA yh%,Y
3180 SBC at4
3190 STA at4
3200 CLC
3210 LDA at1
3220 ADC bt1
3230 STA yi%,Y
3240 LDA at2
3250 ADC bt2
3260 STA yj%,Y
3270 LDA at3
3280 ADC bt3
3290 STA yl%,Y
3300 LDA at4
3310 ADC bt4
3320 STA yh%,Y
3330 DEX
3340 BNE rotlpj
3350 RTS
3360 :
3370 .rotlpj
3380 JMP rotlp
3390 .raab
3400 LDA #4
3410 STA store
3420 CLC
3430 .raac
3440 LDA bt4
3450 BPL raad
3460 SEC
3470 .raad
3480 ROR bt4
3490 ROR bt3
3500 ROR bt2
3510 ROR bt1
3520 CLC
3530 DEC store
3540 BNE raac
3550 RTS
3560 :
3570 .hpress
3580 JSR plot
3590 .hloop1
3600 LDY #&FF
3610 LDA &1900,Y
3620 TAX
3630 INX
3640 .hloop
3650 CLC
3660 INY
3670 LDA xl%,Y
3680 ADC store
3690 STA xl%,Y
3700 LDA xh%,Y
3710 ADC ovflw
3720 STA xh%,Y
3730 DEX
3740 BNE hloop
3750 LDA #&FF
3760 STA flag
3770 JSR inc
3780 BMI hloop1
3790 JSR plot
3800 RTS
3810 :
3820 .vpress
3830 JSR plot
3840 .vloop1
3850 LDY #&FF
3860 LDA type%,Y
3870 TAX
3880 INX
3890 .vloop
3900 CLC
3910 INY
3920 LDA yl%,Y
3930 ADC store
3940 STA yl%,Y
3950 LDA yh%,Y
3960 ADC ovflw
3970 STA yh%,Y
3980 DEX
3990 BNE vloop
4000 LDA #&FF
4010 STA flag
4020 JSR inc
4030 BMI vloop1
4040 JSR plot
4050 RTS
4060 :
4070 .xred
4080 LDA #0
4090 STA store
4100 STA ovflw
4110 JSR scale
4120 RTS
4130 :
4140 .xmag
4150 LDA #0
4160 STA store
4170 LDA #&FF
4180 STA ovflw
4190 JSR scale
4200 RTS
4210 :
4220 .yred
4230 LDA #&FF
4240 STA store
4250 LDA #0
4260 STA ovflw
4270 JSR scale
4280 RTS
4290 :
4300 .ymag
4310 LDA #&FF
4320 STA store
4330 STA ovflw
4340 JSR scale
4350 RTS
4360 :
4370 .min
4380 JSR xred
4390 JSR yred
4400 RTS
4410 :
4420 .max
4430 JSR xmag
4440 JSR ymag
4450 RTS
4460 :
4470 .scale
4480 LDA #0
4490 STA bt1
4500 STA bt2
4510 STA bt3
4520 STA bt4
4530 LDY &19FF
4540 LDA store
4550 BNE ysetup
4560 .xsetup
4570 LDA #&1B
4580 STA bt1+1
4590 LDA #&1C
4600 STA bt2+1
4610 LDA #&1D
4620 STA bt3+1
4630 LDA #&1E
4640 STA bt4+1
4650 JMP scalp
4660 .ysetup
4670 LDA #&1F
4680 STA bt1+1
4690 LDA #&20
4700 STA bt2+1
4710 LDA #&21
4720 STA bt3+1
4730 LDA #&22
4740 STA bt4+1
4750 .scalp
4760 LDA (bt4),Y
4770 STA at4
4780 LDA (bt3),Y
4790 STA at3
4800 LDA (bt2),Y
4810 STA at2
4820 LDA (bt1),Y
4830 STA at1
4840 LDX #3
4850 .dlp
4860 CLC
4870 LDA at4
4880 BPL pos
4890 SEC
4900 .pos
4910 ROR at4
4920 ROR at3
4930 ROR at2
4940 ROR at1
4950 DEX
4960 BNE dlp
4970 LDA ovflw
4980 BNE larger
4990 .smaller
5000 LDA (bt1),Y
5010 SEC
5020 SBC at1
5030 STA (bt1),Y
5040 LDA (bt2),Y
5050 SBC at2
5060 STA (bt2),Y
5070 LDA (bt3),Y
```

Continued ▶

◀ Baldwin's listing 1 continued

```
5080 SBC at3
5090 STA (bt3),Y
5100 LDA (bt4),Y
5110 SBC at4
5120 STA (bt4),Y
5130 JMP scend
5140 .larger
5150 CLC
5160 LDA at1
5170 ADC (bt1),Y
5180 STA (bt1),Y
5190 LDA at2
5200 ADC (bt2),Y
5210 STA (bt2),Y
5220 LDA at3
5230 ADC (bt3),Y
5240 STA (bt3),Y
5250 LDA at4
5260 ADC (bt4),Y
5270 STA (bt4),Y
5280 .scend
5290 DEY
5300 CPY #&FF
5310 BNE scalp
5320 RTS
5330 J:NEXT
5340 ENDPROC
5350 :
5360 DEF PROCcheck
5370 LOCAL sum%
5380 sum%=0
5390 FOR byte%=&1500 TO P%-1
5400 sum%=sum%+?byte%
5410 NEXT byte%
5420 P%=P%-&1500
5430 IF sum%=101408 PROCoscli("SAVE COD
E 1500+"+STR$~P%):ENDPROC
5440 PRINT sum%;"Checksum error - pleas
e check listing"
5450 ENDPROC
5460 :
5470 DEF PROCoscli($oscli%)
5480 PRINT"*"$oscli%
5490 X%=oscli%:Y%=oscli% DIV 256
5500 CALL &FFF7:ENDPROC
```

Listing 2. The main Super Plot program

```
10 REM Super Plot
20 REM by Jonathan Baldwin
30 REM for BBC B/B+/M/E
40 REM (c) Acorn User November 1986
50 :
60 IF PAGE<&2300 PROCrelocate
70 MODE 4
80 *LOAD CODE
90 PROCinit
100 PROCdis(t$)
110 PROCdel
120 PROCset:PROCbox(nx%,ny%)
130 ON ERROR PROCerr
140 IF c%=FALSE PROCload
150 PROCmain
160 MODE 7
170 END
180 :
190 DEF PROCmain
200 REPEAT
```

Continued ▶

◀ Baldwin's listing 2 continued

```
210 PROCi(3,s$)
220 REPEAT
230 *FX 15
240 PROCcm:PROCcoord
250 IF (nx%<>vx% OR ny%<>vy%) PROCsq
260 IF (INKEY-99 AND fl%=TRUE) PROCban
d
270 IF INKEY-2 nx%=0:ny%=0
280 IF INKEY-90 CLG:PROCnew:PROCbox(nx
%,ny%)
290 IF in%<1 GOTO 380
300 IF INKEY-21 PROCmir
310 IF INKEY-117 PROCplus
320 IF INKEY-118 PROCminus
330 IF INKEY-23 PROCpt
340 IF INKEY-119 PROCends
350 IF INKEY-1 PROCmac
360 *FX200
370 ?&19FF=in%:?&1AFF=N%
380 UNTIL (in%>&FD OR INKEY-97 OR INKE
Y-33)
390 PROCset
400 IF INKEY-33 PROCsave:PROCldata:PRO
Cload ELSE PROCch
410 UNTIL G%>2 AND G%<5
420 *FX 4
430 ENDPROC
440 :
450 DEF PROCinit
460 *FX 4,1
470 VDU 29,640;512;19,0,4;0;
480 VDU 23;11,0;0;0;0
490 PROCbdr(-639,-511,639,340)
500 PROCbdr(-630,410,630,496)
510 PROCbdr(-639,398,639,508)
520 s$="<SPACE> TO DRAW: <FN>KEYS TO E
DIT"
530 t$="***SUPER-PLOT***"
540 a$="<--> "
550 b$="ARROWS MOVE BOX: <RET> FIXES"
560 DIM cli% 40
570 in%=-1:N%=-1:?&19FF=in%:?&1AFF=N%
580 type%=&1900:pnt%=&1A00
590 ?type%=4:?pnt%=0
600 xi%=&1B00:xj%=&1C00
610 xl%=&1D00:xh%=&1E00
620 yi%=&1F00:yj%=&2000
630 yl%=&2100:yh%=&2200
640 c%=FALSE:fl%=TRUE
650 nx%=0:ny%=0:ic%=12:es%=1
660 speed%=&84:J%=0:V%=0
670 PROCcalc(0):GCOL 3,3
680 VDU 24,-635;-508;635;338;
690 ENDPROC
700 :
710 DEF PROCbdr(xl,yb,xr,yt)
720 PLOT 12,xl,yb:PLOT14,xr,yb
730 PLOT 14,xr,yt:PLOT14,xl,yt
740 PLOT 14,xl,yb
750 ENDPROC
760 :
770 DEF PROCnew
780 in%=-1:N%=-1:J%=0:V%=0
790 PROCcalc(0)
800 ?type%=4:?pnt%=0
810 ENDPROC
820 :
830 DEF FNx(r%)=xl%?r%+xh%?r%*256
840 :
850 DEF FNy(r%)=yl%?r%+yh%?r%*256
```

Continued ▶

◀ Baldwin's listing 2 continued

```
 860 :
 870 DEF FNg
 880 REPEAT
 890 G%=INSTR("YyNn",GET$)
 900 UNTIL G%>0 AND G%<5
 910 =G%
 920 :
 930 DEF FNchoose
 940 PROCprbox(J%,0)
 950 IF J%>N% J%=N%
 960 es%=es%+1
 970 REPEAT
 980 IF INKEY-26 PROCbk
 990 IF INKEY-122 PROCfwd
1000 UNTIL INKEY-74 AND f1%=TRUE
1010 =J%
1020 :
1030 DEF PROCbk
1040 PROCbox(ox%,oy%)
1050 J%=J%-1
1060 IF J%<0 J%=N%
1070 PROCprbox(J%,0)
1080 f1%=TRUE
1090 ENDPROC
1100 :
1110 DEF PROCfwd
1120 PROCbox(ox%,oy%)
1130 J%=J%+1
1140 IF J%>N% J%=0
1150 PROCprbox(J%,0)
1160 f1%=TRUE
1170 ENDPROC
1180 :
1190 DEF PROCset
1200 PROCset2
1210 ox%=nx%:oy%=ny%
1220 ENDPROC
1230 :
1240 DEF PROCset2
1250 vx%=nx%:vy%=ny%:ENDPROC
1260 :
1270 DEF PROCcoord
1280 IF INKEY-58 ny%=ny%+ic%:f1%=TRUE
1290 IF INKEY-42 ny%=ny%-ic%:f1%=TRUE
1300 IF INKEY-26 nx%=nx%-ic%:f1%=TRUE
1310 IF INKEY-122 nx%=nx%+ic%:f1%=TRUE
1320 ENDPROC
1330 :
1340 DEF PROCcm
1350 IF INKEY-114 ic%=4:?speed%=0:VDU 7
1360 IF INKEY-115 ic%=12:?speed%=4:VDU
7
1370 IF INKEY-116 ic%=20:?speed%=8:VDU
7
1380 ENDPROC
1390 :
1400 DEF PROCsq
1410 PROCbox(vx%,vy%):PROCset2
1420 PROCbox(nx%,ny%)
1430 ENDPROC
1440 :
1450 DEF PROCbox(x%,y%)
1460 PLOT 69,x%,y%:PLOT 12,x%-12,y%-12
1470 PLOT 13,x%+12,y%-12
1480 PLOT 13,x%+12,y%+12
1490 PLOT 13,x%-12,y%+12
1500 PLOT 13,x%-12,y%-12
1510 ENDPROC
1520 :
```

Continued ▶

◀ Baldwin's listing 2 continued

```
1530 DEF PROCband
1540 PROCbox(nx%,ny%):PROCset
1550 es%=0:N%=N%+1
1560 PROCinc(12,N%):PROCcalc(N%)
1570 f1%=FALSE:f%=FALSE
1580 PROCdis("*RUBBER-BANDING*")
1590 PROCi(3,"<SPACE> TO KEEP: <RETURN>
TO DROP")
1600 REPEAT
1610 PROCcoord:PROCcm
1620 IF nx%<>vx% OR ny%<>vy% PROCrub
1630 IF INKEY-99 AND f1%=TRUE PROCadd
1640 UNTIL INKEY-74 OR in%>&FD
1650 PLOT 12,ox%,oy%:PLOT 13,nx%,ny%
1660 IF f%=FALSE N%=N%-1:in%=in%-1
1670 ?&19FF=in%:?&1AFF=N%
1680 f1%=TRUE:es%=1
1690 PROCbox(nx%,ny%):PROCtitle
1700 ENDPROC
1710 :
1720 DEF PROCrub
1730 PROCline(vx%,vy%)
1740 PROCline(nx%,ny%):PROCset2
1750 ENDPROC
1760 :
1770 DEF PROCadd
1780 N%=N%+1:PROCinc(13,N%)
1790 PROCcalc(N%):PROCset
1800 f1%=FALSE:f%=TRUE
1810 ENDPROC
1820 :
1830 DEF PROCline(x%,y%)
1840 PLOT 12,ox%,oy%:PLOT 13,x%,y%
1850 ENDPROC
1860 :
1870 DEF PROCinc(t%,n%)
1880 in%=in%+1
1890 type%?in%=t%:pnt%?in%=n%
1900 ENDPROC
1910 :
1920 DEF PROCcalc(n%)
1930 !&70=nx%:!&78=ny%
1940 PROCcalx(n%):PROCcaly(n%)
1950 ENDPROC
1960 :
1970 DEF PROCcalx(n%)
1980 xl%?n%=?&70:xh%?n%=?&71
1990 xi%?n%=?&72:xj%?n%=?&73
2000 ENDPROC
2010 :
2020 DEF PROCcaly(n%)
2030 yl%?n%=?&78:yh%?n%=?&79
2040 yi%?n%=?&7A:yj%?n%=?&7B
2050 ENDPROC
2060 :
2070 DEF PROCdraw
2080 IFin%<1 ENDPROC
2090 ?&19FF=in%:?&1AFF=N%
2100 CALL &1500
2110 ENDPROC
2120 :
2130 DEF PROCtitle
2140 PROCtop:PROCi(3,s$)
2150 PROCdis(t$)
2160 ENDPROC
2170 :
2180 DEF PROCch
2190 IF in%=-1 GOTO 2250
2200 PROCi(6,"THIS PICTURE DELETED? <Y/
N>")
```

Continued ▶

◀ **Baldwin's listing 2 continued**

```
2210 G%=FNg
2220 IF G%<3 PROCdraw ELSE PROCsave
2230 PROCnew
2240 IF G%>2 PROCload:ENDPROC
2250 PROCi(8,"CONTINUE PROGRAM? <Y/N>")
2260 G%=FNg:IF G%<3 PROCload
2270 ENDPROC
2280 :
2290 DEF PROCload
2300 PROCtop
2310 PRINTTAB(3,1);"1:START DRAWING " T
AB(21,1);"2:LOAD FILE ONLY"
2320 PRINTTAB(9,2);"3:LOAD FILE WITH IM
AGE"
2330 f%=FALSE
2340 REPEAT
2350 PROCi(9,"PRESS NUMBER OF CHOICE")
2360 G%=GET
2370 IF G%=49 f%=TRUE
2380 IF G%=50 PROCld
2390 IF G%=51 PROCld:PROCdraw
2400 UNTIL f%=TRUE
2410 PROCtop:PROCtitle
2420 ENDPROC
2430 :
2440 DEF PROCld
2450 REPEAT
2460 PROCin
2470 UNTIL LEN(fn$)<8
2480 REM:CASSETTE USERS ONLY
2490 REM:VDU 28,0,4,39,4
2500 PROCoscli("LOAD "+fn$)
2510 PROCldata
2520 REM:VDU 28,0,31,39,0
2530 ENDPROC
2540 :
2550 DEF PROCldata
2560 in%=?&19FF:N%=?&1AFF
2570 RESTORE 2650
2580 FOR F%=3 TO 0 STEP-1
2590 READ ad%
2600 st%=&1B00+(N%+1)*F%
2610 FOR T%=0 TO N%
2620 ad%?T%=st%?T%
2630 NEXT T%
2640 NEXT F%
2650 DATA yh%,yl%,xh%,xl%
2660 ENDPROC
2670 :
2680 DEF PROCsave
2690 IF in%<0 ENDPROC
2700 PROCdis("**DATA-SAVING**")
2710 REPEAT
2720 PROCin
2730 UNTIL LEN(fn$)<8
2740 REM:CASSETTE USERS ONLY
2750 REM:VDU 28,0,4,39,4
2760 RESTORE 2870
2770 FOR F%=0 TO 3
2780 st%=&1B00+((N%+1)*F%)
2790 READ ad%
2800 FOR T%=0 TO N%
2810 st%?T%=ad%?T%
2820 NEXT T%
2830 NEXT F%
2840 M%=&FFFF1900
2850 W%=(&FFFF1B00+(N%+1)*4)
2860 IF fn$<>"" PROCoscli("SAVE "+fn$+"
"+STR$~M%+" "+STR$~W%)
2870 DATA xl%,xh%,yl%,yh%
```

Continued ▶

◀ **Baldwin's listing 2 continued**

```
2880 REM:VDU 28,0,31,39,0
2890 ENDPROC
2900 :
2910 DEF PROCin
2920 PROCi(3,"PICTURE'S NAME?")
2930 INPUT SPC(1)fn$
2940 ENDPROC
2950 :
2960 DEF PROCi(n%,m$)
2970 *FX 15
2980 PRINTTAB(0,4);SPC(40)
2990 le%=LEN(m$)+n%+1
3000 PRINTTAB(n%,4);m$
3010 VDU 31,le%,4
3020 ENDPROC
3030 :
3040 DEF PROCtop
3050 FOR T%=1 TO 2
3060 PRINTTAB(1,T%);STRING$(38," ")
3070 NEXT T%
3080 ENDPROC
3090 :
3100 DEF PROCoscli($cli%)
3110 X%=cli%:Y%=cli% DIV 256
3120 CALL &FFF7
3130 ENDPROC
3140 :
3150 DEF PROCmir
3160 *FX 15,1
3170 PROCdraw
3180 FOR T%=0 TO N%+1
3190 ?&70=xl%?T%:?&71=xh%?T%
3200 ?&72=xi%?T%:?&73=xj%?T%
3210 !&70=-!&70:PROCcalx(T%)
3220 NEXT T%
3230 PROCdraw
3240 ENDPROC
3250 :
3260 DEF PROCpt
3270 PROCdis("***POINT-EDIT***")
3280 PROCi(3,a$+b$)
3290 PROCbox(nx%,ny%)
3300 pt%=FNchoose
3310 nx%=FNx(pt%):ny%=FNy(pt%)
3320 es%=1:fl%=FALSE
3330 PROCset2
3340 PROCi(3,b$+" POINT")
3350 REPEAT
3360 *FX 15
3370 PROCcoord:PROCcm
3380 IF nx%<>vx% OR ny%<>vy% PROCsq
3390 UNTIL INKEY-74 AND fl%=TRUE
3400 PROCdraw:PROCcalc(pt%)
3410 PROCdraw
3420 PROCset:PROCtitle
3430 ENDPROC
3440 :
3450 DEF PROCplus
3460 PROCdis("*LINE-ADDITIONS*")
3470 PROCi(0,a$+b$+" START")
3480 PROCbox(nx%,ny%)
3490 st%=FNchoose
3500 PROCi(1,a$+b$+" END")
3510 fl%=FALSE
3520 J%=J%+1:IF J%>=N% J%=0
3530 end%=FNchoose
3540 IF st%=end% PROCbox(nx%,ny%):PROCt
itle:ENDPROC
3550 PROCdraw
3560 T%=-1:f%=FALSE
3570 REPEAT
```

Continued ▶

◀ Baldwin's listing 2 continued

```
3580 T%=T%+1
3590 PROCslot(st%,end%)
3600 PROCslot(end%,st%)
3610 UNTIL T%=in%-1 OR f%=TRUE
3620 PROCcr(st%,end%)
3630 PROCcr(end%,st%)
3640 IF f%=FALSE PROCinc(12,st%):PROCin
c(13,end%)
3650 PROCcheck
3660 PROCprbox(st%,0)
3670 PROCprbox(end%,0)
3680 es%=1:PROCdraw
3690 PROCbox(nx%,ny%):PROCtitle
3700 ENDPROC
3710 :
3720 DEF PROCslot(be%,fi%)
3730 IF pnt%?T%=be% AND pnt%?(T%+1)=fi%
type%?(T%+1)=13:f%=TRUE
3740 ENDPROC
3750 :
3760 DEF PROCcr(be%,fi%)
3770 IF f%=TRUE OR be%<>pnt%?in% ENDPRO
C
3780 in%=in%+1
3790 pnt%?in%=fi%:type%?in%=13
3800 f%=TRUE
3810 ENDPROC
3820 :
3830 DEF PROCcheck
3840 D%=-1
3850 REPEAT
3860 D%=D%+1
3870 IF (type%?D%=12 AND type%?(D%+1)=1
2) OR pnt%?D%=pnt%?(D%+1) PROCout:in%=in
%-1
3880 UNTIL D%=in%-1
3890 IF type%?in%=12 in%=in%-1
3900 ENDPROC
3910 :
3920 DEF PROCout
3930 IF type%?D%=13 W%=D%+1 ELSE W%=D
3940 FOR I%=W% TO in%-1
3950 pnt%?I%=pnt%?(I%+1):type%?I%=type%
?(I%+1)
3960 NEXT
3970 ENDPROC
3980 :
3990 DEF PROCprbox(T%,Q%)
4000 IF Q%=1 E%=pnt%?T% ELSE E%=T%
4010 ox%=FNx(E%):oy%=FNy(E%)
4020 PROCbox(ox%,oy%)
4030 ENDPROC
4040 :
4050 DEF PROCends
4060 PROCdis("HIDDEN-LINE-EDIT")
4070 PROCbox(nx%,ny%):PROCgetln
4080 *FX 200,1
4090 PROCi(2,"<SPACE> CHOOSES END: <RET
URN> TO FIX")
4100 PROCprex(V%):U%=V%
4110 *FX 15
4120 REPEAT
4130 G%=GET
4140 IF G%=32 PROCmx
4150 UNTIL G%=13
4160 PROCprex(U%)
4170 IF U%=V% E%=pnt%?(V%+1):F%=pnt%?V%
ELSE E%=pnt%?V%:F%=pnt%?(V%+1)
4180 ox%=FNx(E%):oy%=FNy(E%)
4190 nx%=FNx(F%):ny%=FNy(F%)
```

Continued ▶

◀ Baldwin's listing 2 continued

```
4200 PROCset2:fl%=FALSE
4210 PROCi(0,b$+" <SPC>DROPS")
4220 REPEAT
4230 PROCcoord:PROCcm
4240 IF nx%<>vx% OR ny%<>vy% PROCrub:fl
%=TRUE
4250 UNTIL(INKEY-99 OR(INKEY-74 AND fl%
=TRUE))
4260 PROCbox(nx%,ny%)
4270 IF INKEY-99 PROCret:ENDPROC
4280 IF U%=in% PROCfind(U%):IF f%=FALSE
PROCmv:ENDPROC
4290 N%=N%+1:PROCcalc(N%)
4300 FOR T%=in% TO V%+1 STEP-1
4310 type%?(T%+1)=type%?T%
4320 pnt%?(T%+1)=pnt%?T%
4330 NEXT T%
4340 in%=in%+1:pnt%?(V%+1)=N%
4350 IF V%=U% PROCtp(12,13):PROCplot(69
,F%):PROCplot(69,N%) ELSE PROCtp(13,12)
4360 PROCdraw
4370 IF V%=U% IF type%?(V%)=12 PROCedit
(V%)
4380 IF V%<>U% AND V%+2<in% IF type%?(V
%+3)=12 PROCedit(V%+2)
4390 PROCcheck:PROCdraw
4400 PROCtitle
4410 ENDPROC
4420 :
4430 DEF PROCret
4440 PROCline(nx%,ny%)
4450 PROCplot(12,E%)
4460 PROCplot(13,F%):PROCtitle
4470 ENDPROC
4480 :
4490 DEF PROCtp(a%,b%)
4500 type%?(V%+1)=a%
4510 type%?(V%+2)=b%
4520 ENDPROC
4530 :
4540 DEF PROCmx
4550 IF U%=V% PROCprex(U%):U%=V%+1:PROC
prex(U%) ELSE PROCprex(U%):U%=V%:PROCpre
x(U%)
4560 ENDPROC
4570 :
4580 DEF PROCplot(n%,r%)
4590 PLOT n%,FNx(r%),FNy(r%)
4600 ENDPROC
4610 :
4620 DEF PROCprex(T%)
4630 E%=pnt%?T%
4640 x%=FNx(E%):y%=FNy(E%)
4650 PLOT 4,x%-18,y%-18
4660 PLOT 6,x%+18,y%+18
4670 PLOT 4,x%-18,y%+18
4680 PLOT 6,x%+18,y%-18
4690 ENDPROC
4700 :
4710 DEF PROCmv
4720 B%=pnt%?in%
4730 PROCcalc(B%)
4740 PROCtitle
4750 ENDPROC
4760 :
4770 DEF PROCminus
4780 PROCdis("**LINE-REMOVAL**")
4790 PROCbox(nx%,ny%)
4800 PROCgetln:PROCdraw
4810 IF type%?V%=12 PROCedit(V%):type%?
V%=12:V%=V%-1
```

Continued ▶

YELLOW PAGES
GRAPHICS

◄ **Baldwin's listing 2 continued**

```
4820 IF V%=in%-1 OR type%?(V%+2)=12 PROCedit(V%+1):type%?(V%+1)=12:PROCcheck ELSE type%?(V%+1)=12
4830 IF in%>0 PROCdraw ELSE in%=-1:N%=-1
4840 PROCbox(nx%,ny%):PROCtitle
4850 ENDPROC
4860 :
4870 DEF PROCgetln
4880 PROCi(0,"<-->ARROWS PUT BOXES ON ENDS <RET> FIXES")
4890 es%=-1
4900 IF V%>=in% V%=0
4910 REPEAT
4920 IF type%?(V%+1)=12 V%=V%+1
4930 UNTIL type%?(V%+1)=13
4940 PROCprbox(V%,1):PROCprbox(V%+1,1)
4950 REPEAT
4960 IF INKEY-26 PROCprbox(V%,1):PROCprbox(V%+1,1):PROCdwn:PROCprbox(V%,1):PROCprbox(V%+1,1)
4970 IF INKEY-122 PROCprbox(V%,1):PROCprbox(V%+1,1):PROCup:PROCprbox(V%,1):PROCprbox(V%+1,1)
4980 UNTIL INKEY-74
4990 es%=1
5000 PROCprbox(V%,1):PROCprbox(V%+1,1)
5010 ENDPROC
5020 :
5030 DEF PROCup
5040 IF V%=in%-1 V%=-1
5050 T%=V%+2
5060 PROCln(1)
5070 ENDPROC
5080 :
5090 DEF PROCdwn
5100 IF V%=0 V%=in%
5110 T%=V%
5120 PROCln(-1)
5130 ENDPROC
5140 :
5150 DEF PROCln(K%)
5160 REPEAT
5170 IF type%?T%=12 T%=T%+K%
5180 UNTIL type%?T%=13
5190 V%=T%-1
5200 ENDPROC
5210 :
5220 DEF PROCedit(t%)
5230 PROCfind(t%)
5240 IF f%=FALSE PROCscrub(t%) ELSE PROCpass(t%)
5250 ENDPROC
5260 :
5270 DEF PROCfind(r%)
5280 T%=-1:f%=FALSE
5290 REPEAT
5300 T%=T%+1
5310 IF T%<>r% AND pnt%?r%=pnt%?T% AND(type%?T%=13 OR type%?(T%+1)=13) f%=TRUE
5320 UNTIL(T%=in% OR f%=TRUE)
5330 ENDPROC
5340 :
5350 DEF PROCscrub(r%)
5360 IF pnt%?r%<N% PROCshft(r%)
5370 N%=N%-1:v%=pnt%?r%
5380 FOR T%=0 TO in%
5390 IF pnt%?T%>v% pnt%?T%=pnt%?T%-1
5400 NEXT T%
5410 PROCpass(r%)
5420 ENDPROC
```

Continued ►

◄ **Baldwin's listing 2 continued**

```
5430 :
5440 DEF PROCshft(r%)
5450 FOR T%=pnt%?r% TO N%-1
5460 xl%?T%=xl%?(T%+1)
5470 xh%?T%=xh%?(T%+1)
5480 xi%?T%=xi%?(T%+1)
5490 xj%?T%=xj%?(T%+1)
5500 yl%?T%=yl%?(T%+1)
5510 yh%?T%=yh%?(T%+1)
5520 yi%?T%=yi%?(T%+1)
5530 yj%?T%=yj%?(T%+1)
5540 NEXT
5550 ENDPROC
5560 :
5570 DEF PROCpass(r%)
5580 FOR T%=r% TO in%-1
5590 type%?T%=type%?(T%+1)
5600 pnt%?T%=pnt%?(T%+1)
5610 NEXT T%
5620 in%=in%-1
5630 ENDPROC
5640 :
5650 DEF PROCdel
5660 TIME=0:REPEAT UNTIL TIME=200
5670 ENDPROC
5680 :
5690 DEF PROCdis(d$)
5700 LOCAL A%,X%,Y%
5710 A%=10:X%=0:Y%=10:b=&A00
5720 VDU 31,4,1
5730 FOR T%=1 TO LENd$
5740 p$=MID$(d$,T%,1)
5750 ?b=ASCp$
5760 CALL &FFF1
5770 VDU 23,240,b?1,b?1,b?2,b?2,b?3,b?3,b?4,b?4
5780 VDU 23,241,b?5,b?5,b?6,b?6,b?7,b?7,b?8,b?8
5790 VDU 240,8,10,241,11,9
5800 NEXT T%
5810 ENDPROC
5820 :
5830 DEF PROCmac
5840 PROCdis("MACRO-TRANSFORMS")
5850 PROCi(11,"MOVE WHOLE DESIGN.")
5860 CALL &1508
5870 PROCtitle
5880 ENDPROC
5890 :
5900 DEF PROCerr
5910 *FX 4
5920 c%=TRUE
5930 IF ERR=17 PROCesc("USE <TAB> TO EXIT PROGRAM"):PROCtitle:ENDPROC
5940 IF ERR>&BE AND ERR<&FF PROCesc("FILE-SYSTEM ERROR"):PROCload:ENDPROC
5950 REPORT:PRINT" at line ";ERL:END
5960 ENDPROC
5970 :
5980 DEF PROCesc(i$)
5990 IF es%=0 PLOT 12,ox%,oy%:PLOT 13,nx%,ny%
6000 IF es%<0 PROCprbox(V%,1):PROCprbox(V%+1,1)
6010 IF es%>1 PROCprbox(J%,0)
6020 IF es%>2 PROCprbox(st%,0)
6030 IF es%<>1 PROCbox(nx%,ny%)
6040 PROCset:es%=1
6050 REM:VDU 28,0,4,39,4
```

Continued ►

◄ Baldwin's listing 2 continued

```
6060 PROCi(7,i$):PROCdel
6070 REM:VDU 28,0,31,39,0
6080 ENDPROC
6090 :
6100 DEF PROCrelocate
6110 PRINT"Page must be set at &2300"
6120 END
```

Listing 3. The Super-Plot mode convertor

```
   10 REM Screen Converter
   20 REM by Jonathan Baldwin
   30 REM for BBC B/B+/M/E
   40 REM (c) Acorn User November 1986
   50 :
   60 IF PAGE<&2300 PRINT"Page must be &
2300":END
   70 ON ERROR VDU 26,12:REPORT:PRINT" a
t line ";ERL:END
   80 *LOAD CODE 1500
   90 MODE 7
  100 REPEAT
  110 INPUT"WHICH MODE",M%
  120 UNTIL M%>=0 AND M%<6 AND M%<>3
  130 MODE M%
  140 PROCinit
  150 REPEAT
  160 PROCld
  170 PROCdraw
  180 UNTIL fn$=""
  190 PROCsave
  200 VDU 26,12:PRINT"Saved"
  210 END
  220 :
  230 DEF PROCinit
  240 VDU 29,640;512;
  250 VDU 23;11,0;0;0;0
  260 PROCbdr(-639,-511,639,340)
  270 PROCbdr(-630,410,630,496)
  280 PROCbdr(-639,398,639,508)
  290 DIM cli% 40
  300 in%=-1:N%=-1:?&19FF=in%:?&1AFF=N%
  310 type%=&1900:pnt%=&1A00
  320 ?type%=4:?pnt%=0
  330 xi%=&1B00:xj%=&1C00
  340 xl%=&1D00:xh%=&1E00
  350 yi%=&1F00:yj%=&2000
  360 yl%=&2100:yh%=&2200
  370 nx%=0:ny%=0
  380 VDU 24,-639;-512;639;340;
  390 ENDPROC
  400 :
  410 DEF PROCbdr(xl,yb,xr,yt)
  420 PLOT 4,xl,yb:PLOT 5,xr,yb
  430 PLOT 5,xr,yt:PLOT 5,xl,yt
  440 PLOT 5,xl,yb
  450 ENDPROC
  460 :
  470 DEF PROCdraw
  480 IF in%<1 ENDPROC
  490 ?&19FF=in%:?&1AFF=N%
  500 CALL &1500
  510 ENDPROC
  520 :
  530 DEF PROCld
  540 PRINTTAB(2,1);"LOADING FILES"
  550 PROCin:IF fn$="" ENDPROC
  560 VDU 28,0,4,39,4
```

Continued ►

► Baldwin's listing 3 continued

```
  570 PROCoscli("LOAD "+fn$)
  580 in%=?&19FF:N%=?&1AFF
  590 RESTORE 950
  600 FOR F%=3 TO 0 STEP-1
  610 READ ad%
  620 st%=&1B00+(N%+1)*F%
  630 FOR T%=0 TO N%
  640 ad%?T%=st%?T%
  650 NEXT T%
  660 NEXT F%
  670 VDU 28,0,31,39,0
  680 ENDPROC
  690 :
  700 DEF PROCsave
  710 IF M%>0 AND M%<3 U%=&3C80:W%=&8000
  720 IF M%>3 AND M%<6 U%=&5800:W%=&8000
  730 PRINTTAB(2,1);"SAVING SCREEN"
  740 PROCin
  750 PROCoscli("SAVE "+fn$+" "+STR$~U%+
" "+STR$~W%)
  760 ENDPROC
  770 :
  780 DEF PROCin
  790 PRINTTAB(2,4);STRING$(36," ")
  800 PRINTTAB(2,2);"PICTURE'S NAME"
  810 INPUTTAB(2,4);fn$
  820 ENDPROC
  830 :
  840 DEF PROCtop
  850 FOR T%=1 TO 2
  860 PRINTTAB(1,T%);STRING$(38," ")
  870 NEXT T%
  880 ENDPROC
  890 :
  900 DEF PROCoscli($cli%)
  910 X%=cli%:Y%=cli%DIV256
  920 CALL &FFF7
  930 ENDPROC
  940 :
  950 DATA yh%,yl%,xh%,xl%
```

See A day at the flicks, page 95

Listing 1. Smooth rotation using mode 4

```
   10 REM Dual Screen Li
sting 1
   20 REM by Peter Voke
   30 REM for BBC B/B+/M
   40 REM (c) Acorn User
 November 1986
   50 :
   60 MODE 1:MODE 4:HIME
M=&3000
   70 VDU 23;11,0;0;0;
   80 X%=128:Y%=0:U%=128
:V%=8
   90 REPEAT
  100 PROCscreen(1)
  110 PROCdraw(0,X%)
  120 Y%=Y%+X% DIV 16:X%
=X%-Y% DIV 16
  130 Y%=Y%+X% DIV 16:X%
=X%-Y% DIV 16
  140 PROCdraw(1,X%)
  150 PROCscreen(2)
  160 PROCdraw(0,U%)
  170 V%=V%+U% DIV 16:U%
=U%-V% DIV 16
  180 V%=V%+U% DIV 16:U%
=U%-V% DIV 16
  190 PROCdraw(1,U%)
  200 UNTIL FALSE
  210 END
  220 :
  230 DEF PROCscreen(A%)
  240 M%=1+A%*5
  250 VDU 23;12,M%,0;0;0
;
  260 N%=17-M%
  270 ?&351=N%*8:?&34E=N
%*8
  280 ENDPROC
  290 :
  300 DEF PROCdraw(C%,S%
)
```

Continued ►

◀ Vokes listing 1 continued

```
 310 VDU 19,1,SGNS%+2;0
;
 320 GCOL 0,C%
 330 MOVE 640-S%,512:MO
VE 640+S%,512
 340 PLOT 85,640,700
 350 ENDPROC
```

Listing 2. Using mode 5 but exactly the same PROCscreen

```
   10 REM Dual Screen Li
sting 2
   20 REM by Peter Voke
   30 REM for BBC B/B+/M
   40 REM (c) Acorn User
 November 1986
   50 :
   60 MODE 1:MODE 5:HIME
M=&2300
   70 VDU 23;11;0;0;0;
   80 VDU 19,1,4;0;19,3,
2;0;
   90 VDU 5
  100 PROCsetup
  110 A%=2
  120 REPEAT
  130 PROCscreen(A%)
  140 O%=U%:P%=V%:U%=X%:
V%=Y%
  150 IF INKEY-67:X%=X%+
16
  160 IF INKEY-98:X%=X%+
1264
  170 IF INKEY-73:Y%=Y%+
16
  180 IF INKEY-105:Y%=Y%
+1008
  190 X%=X% MOD 1280:Y%=
Y% MOD 1024
  200 PROCdraw(O%,P%,3)
  210 PROCdraw(X%,Y%,3)
  220 A%=3-A%
  230 UNTIL FALSE
  240 :
  250 DEF PROCscreen(A%)
  260 M%=1+A%*5
  270 VDU 23;12,M%,0;0;0
;
  280 N%=17-M%
  290 ?&351=N%*8:?&34E=N
%*8
  300 ENDPROC
  310 :
  320 DEF PROCdraw(X%,Y%
,C%)
  330 GCOL 3,C%:MOVE X%,
Y%
  340 VDU 67+A%*6
  350 ENDPROC
  360 :
  370 DEF PROCsetup
  380 FOR A%=1 TO 2
  390 PROCscreen(A%)
  400 GCOL0,1
  410 FOR Y%=A%*4 TO 102
0 STEP 12
  420 MOVE 0,Y%:DRAW 128
0,Y%:NEXT
  430 PROCdraw(64,960,3)
  440 X%=64:Y%=960
  450 U%=X%:V%=Y%
  460 NEXT
  470 ENDPROC
```

Listing 3. Combining mode 7 and 1 for a graphics utility

```
   10 REM Dual Screen Li
sting 3
   20 REM by Peter Voke
   30 REM for BBC B/B+/M
   40 REM (c) Acorn User
 November 1986
   50 :
   60 MODE 7:PROCasm
   70 MODE 1:HIMEM=&2C00
   80 PROCscreen(2):PROC
test
   90 PROCscreen(1):PROC
front
  100 PROCchoose
  110 END
  120 :
  130 DEF PROCscreen(A%)
  140 IFA%=1RESTORE1240
ELSE RESTORE1280
  150 FOR R%=0 TO 13
  160 READ V%:VDU 23;R%,
V%,0;0;0;
  170 NEXT
  180 FOR B%=0 TO 19
  190 READ V%:B%?&34E=V%
  200 NEXT
  210 READ V%:?&E0=V%
  220 READ X%:A%=154:Y%=
0:CALL&FFF4
  230 VDU 26,14
  240 ENDPROC
  250 :
  260 DEF PROCfront
  270 VDU 28,6,23,39,2
  280 PRINT'''CHR$130"GR
APHICS PROCESSOR DEMO"
  290 PRINT''CHR$134"1)
Load screen"
  300 PRINT'CHR$134"2) S
ave screen"
  310 PRINT'CHR$134"3) P
rocess screen"
  320 PRINT'CHR$134"SB V
iew screen"
  330 PRINT''" Please en
ter choice"
  340 ENDPROC
  350 :
  360 DEF PROCchoose
  370 A%=1
  380 REPEAT
  390 Z=GET AND &F
  400 IF Z=1:*LOAD scree
n 2C00
  410 IF Z=2:*SAVE newsc
r 2C00+5000 3000 3000
  420 IF Z=3:CALL code
  430 IF Z=0:A%=3-A%:PRO
Cscreen(A%)
  440 UNTIL FALSE
  460 DEF PROCtest
  470 CLG:GCOL 0,1
  480 MOVE 0,500:MOVE 50
0,0
  490 PLOT 85,1279,1023
  500 ENDPROC
  510 :
  520 DEF PROCasm
  530 VDU 15
  540 FOR pass%=0 TO 2 S
TEP 2
  550 P%=&900
  560 [OPT pass%
  570 .code
  580 LDY #0
  590 STY &70
  600 LDA #&2C
  610 STA &71
  620 LDA #&78
  630 STA &72
  640 LDA #&2E
  650 STA &73
  660 .a1
  670 LDA #&11
  680 STA &74
  690 .a2
  700 LDA (&70),Y
  710 AND &74
  720 STA &75
  730 INY
  740 TYA
  750 AND #7
  760 BEQ a7
  770 LDA (&70),Y
  780 .a3
  790 DEY
  800 AND &74
  810 CMP &75
  820 BEQ a4
  830 LDA &74
  840 ORA (&70),Y
  850 STA (&70),Y
  860 BNE a5
  870 .a4
  880 LDA &74
  890 EOR #&FF
  900 AND (&70),Y
  910 STA (&70),Y
  920 .a5
  930 ASL &74
  940 BCC a2
  950 INY
  960 BEQ a6
  970 CPY #&FF
  980 BNE a1
  990 INC &73
 1000 BNE a1
 1010 .a6
 1020 INC &71
 1030 LDA &71
 1040 CMP #&7C
 1050 BNE a1
 1060 RTS
 1070 .a7
 1080 LDA #0
 1090 LDX &73
 1100 CPX #&7C
 1110 BPL a3
 1120 LDA (&72),Y
 1130 JMP a3
 1140 ]NEXT pass%
 1150 T%=0
 1160 FOR A%=code TO P%-
1
 1170 T%=T%+?A%
 1180 NEXT
 1190 IF T%=12136 ENDPRO
C
 1200 PRINT"Checksum Err
or"
 1210 END
 1220 :
 1230 REM MODE 7 DATA
 1240 DATA 63,40,53,36,3
0,2,25,27,19,18,1,0,40,0
 1250 DATA 124,1,0,124,4
0,0,4,7,4,0,32,0,0,0,0,2
30,204,114,0,0
 1260 DATA &B5,&4B
 1270 REM MODE 1 DATA
 1280 DATA 127,80,98,40,
38,0,32,34,1,7,0,0,5,128
 1290 DATA &2C,16,0,&2C,
&80,&2,&50,1,0,&FF,0,&FF
,0,0,0,2,204,103,3,3
 1300 DATA &75,&18
 1310 REM MODE 2 DATA
 1320 DATA 127,80,98,40,
38,0,32,34,2,7,0,0,5,128
 1330 DATA &2C,32,0,&2C,
&80,&2,&50,2,0,&3F,0,&3F
,0,0,0,2,204,103,15,1
 1340 DATA &75,&14
```


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See Putting printers to the test, page 167

Listing 1. Printer benchmark 1, prints concentric circles

```
   10 REM Printer Benchm
ark 1
   20 REM by Martin Phil
lips
   30 REM for BBC B/B+/M
/E with Plus 1
   40 REM (c) Acorn User
 November 1986
   50 :
   60 PROCassemble
   70 PROCchecksum
   80 MODE 1
   90 PROCcircles
  100 VDU 7
  110 CALL dump
  120 END
  130 :
  140 DEF PROCcircles
  150 VDU 19,0,4,0,0,0
  160 VDU 23;8202;0;0;0;
  170 VDU 29,640;512;
  180 FOR N%=100 TO 500
STEP 80
  190 FOR T%=-1 TO 1 STE
P 2
  200 MOVE -N%,0
  210 FOR X%=-N% TO N% S
TEP 8
  220 DRAW X%,T%*(SQR(N%
*N%-X%*X%))
  230 NEXT X%,T%,N%
  240 VDU 29,0;0;
  250 ENDPROC
  260 :
  270 DEF PROCassemble
  280 xlo=&70:xhi=&71:yl
o=&72:yhi=&73
  290 pixel=&74:byte=&75
:bitcount=&76
  300 oswrch=&FFEE:oswor
d=&FFF1
  310 FOR pass=0 TO 2 ST
EP 2:P%=&900
  320 [OPT pass
  330 .dump
  340 LDA #2
  350 JSR oswrch
  360 LDA #255
  370 STA ylo
  380 LDA #3
  390 STA yhi
  400 LDA #27
  410 JSR printer
  420 LDA #65
  430 JSR printer
  440 LDA #8
  450 JSR printer
  460 :
  470 .newline
  480 LDA #0
  490 STA xlo
  500 STA xhi
  510 LDA #27
  520 JSR printer
  530 LDA #75
  540 JSR printer
  550 LDA #64
  560 JSR printer
  570 LDA #1
  580 JSR printer
  590 :
  600 .newcolumn
  610 LDA #8
  620 STA bitcount
  630 :
  640 .readpixel
  650 LDX #xlo
  660 LDY #0
  670 LDA #9
  680 JSR osword
  690 CLC
  700 LDA pixel
  710 BEQ setbyte
  720 SEC
  730 :
  740 .setbyte
  750 ROL byte
  760 LDA ylo
  770 SEC
  780 SBC #4
  790 STA ylo
  800 BCS columnend
  810 DEC yhi
  820 :
  830 .columnend
  840 DEC bitcount
  850 LDA bitcount
  860 BNE readpixel
  870 LDA byte
  880 JSR printer
  890 CLC
  900 LDA #4
  910 ADC xlo
  920 STA xlo
  930 BCC lineend
  940 INC xhi
  950 :
  960 .lineend
  970 LDA xhi
  980 CMP #5
  990 BEQ endline
 1000 LDA #32
 1010 CLC
 1020 ADC ylo
 1030 STA ylo
 1040 BCC newcolumn
 1050 INC yhi
 1060 BCS newcolumn
 1070 :
 1080 .endline
 1090 LDA #10
 1100 JSR printer
 1110 :
 1120 .checkend
 1130 LDA yhi
 1140 BMI end
 1150 JMP newline
 1160 :
 1170 .end
 1180 LDA #12
 1190 JSR printer
 1200 LDA #27
 1210 JSR printer
 1220 LDA #64
 1230 JSR printer
 1240 LDA #3
 1250 JSR oswrch
 1260 RTS
 1270 :
 1280 .printer
 1290 PHA
 1300 LDA #1
 1310 JSR oswrch
 1320 PLA
 1330 JSR oswrch
 1340 RTS
 1350 ]
 1360 NEXT pass
 1370 ENDPROC
 1380 :
 1390 DEF PROCchecksum
 1400 T%=0
 1410 FOR B%=dump TO P%-
1
 1420 T%=T%+?B%
 1430 NEXT
 1440 IF T%=18376 ENDPRO
C
 1450 PRINT"Checksum Err
or.":VDU7
```

Listing 2. Benchmark 2, type styles

```
   10 REM Printer Benchm
ark 2
   20 REM by Martin Phil
lips
   30 REM for BBC B/B+/M
/E with Plus 1
   40 REM (c) Acorn User
 November 1986
   50 :
   60 VDU 2,1,27,1,78,1,
6,7
   70 FOR I%=0 TO 1
   80 FOR J%=0 TO 255 ST
EP 4
   90 VDU 1,27,1,33,1,I%
+J%
  100 IF I%=0 PRINT"Pica
 ";:ELSE PRINT"Elite ";
  110 IF J% AND 4 PRINT"
compressed ";
  120 IF J% AND 8 PRINT"
emphasised ";
  130 IF J% AND 16 PRINT
"double-strike ";
  140 IF J% AND 32 PRINT
"expanded ";
  150 IF J% AND 64 PRINT
"italics ";
  160 IF J% AND 128 PRIN
T"underlined";
  170 PRINT
  180 NEXT J%:NEXT I%
  190 VDU 12,3
```

Listing 3. Benchmark 3, NLQ print

```
   10 REM Printer Benchm
ark 3
   20 REM by Martin Phil
lips
   30 REM for BBC B/B+/M
/E with Plus 1
   40 REM (c) Acorn User
 November 1986
   50 :
   60 VDU 2,1,27,1,78,1,
6,7
   70 VDU 1,27,1,120,1,1
   80 FOR J%=0 TO 255 ST
EP 4
   90 VDU 1,27,1,33,1,J%
  100 PRINT"Pica ";
  110 IF J% AND 4 PRINT"
compressed ";
  120 IF J% AND 8 PRINT"
emphasised ";
  130 IF J% AND 16 PRINT
"double-strike ";
  140 IF J% AND 32 PRINT
"expanded ";
  150 IF J% AND 64 PRINT
"italics ";
  160 IF J% AND 128 PRIN
T"underlined";
  170 PRINT
  180 NEXT J%
  190 VDU 12,3
```

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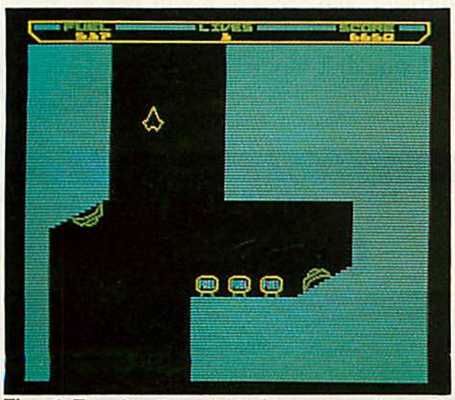
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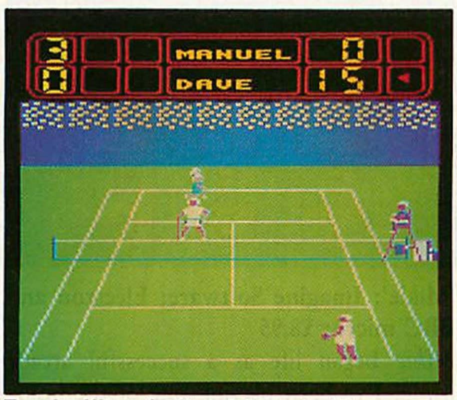
Check out the latest position of your favourite game

TOP 20 BBC MICRO GAMES

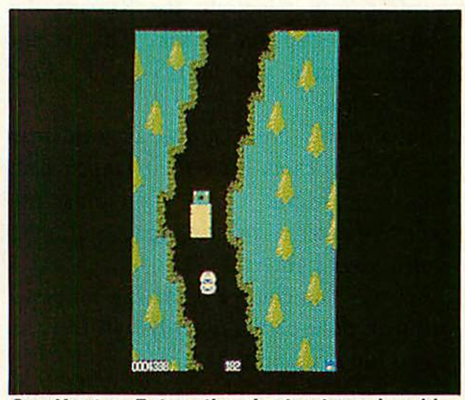
	Title	Publisher	Cassette	Disc	B+	Master	Reviewed
1 (1)	Thrust	Superior	£7.95	£11.95	Yes	Yes	—
2 (–)	Psycastria	Audiogenic	£7.95	£11.95	Yes	Yes	—
3 (–)	Kane	Mastertronic	£1.99	—	No	No	—
4 (–)	League Challenge	Atlantis	£2.99	—	No	No	—
5 (2)	Commando	Elite	£9.95	£11.95	Yes	Yes	August '86
6 (3)	Air Wolf	Elite	£9.95	£14.95	Yes	Yes	—
7 (6)	Cricket	Bug Byte	£2.99	—	Yes	Yes	—
8 (–)	Mikie	Imagine	£8.95	—	No	No	November '86
9 (–)	Commonwealth Games	Tynesoft	£7.95	£9.95	Yes	Yes	—
10 (4)	Ian Botham's Test Cricket	Tynesoft	£7.95	£11.95	Yes	Yes	—
11 (–)	Spy Hunter	US Gold	£9.99	£14.99	No	*	October '86
12 (18)	Yie Ar Kung Fu	Imagine	£9.95	£12.95	Yes*	Yes*	March '86
13 (7)	Star Force 7	Bug Byte	£2.99	—	Yes	Yes	—
14 (10)	Winter Olympics	Tynesoft	£9.95	—	*	*	September '86
15 (–)	Bruce Lee	US Gold	£9.95	£14.95	No	No	August '86
16 (13)	Phantom Combat	Doctor Soft	£9.95	£11.95	Yes	Yes	February '86
17 (5)	Tennis	Bug Byte	£2.99	—	Yes	Yes	September '86
18 (8)	Citadel	Superior	£9.95	£11.95	Yes	*	March '86
19 (–)	Lord Of The Rings	Melbourne House	£15.95	—	*	*	—
20 (–)	Dambusters	US Gold	£9.95	£14.95	*	*	—



Thrust: Topping the charts for a second month



Tennis: Hits a fault and drops to 17



Spy Hunter: Enters the charts at number 11

TOP 10 ELECTRON GAMES

	Title	Publisher	Cassette	Disc	Reviewed
1 (–)	Commonwealth Games	Tynesoft	£7.95	£9.95	—
2 (–)	Galactic Patrol	Mastertronic	£1.99	—	—
3 (–)	Kane	Mastertronic	£1.99	—	—
4 (3)	Commando	Elite	£9.95	£14.95	August '86
5 (–)	Psycastria	Audiogenic	£7.95	£11.95	—
6 (–)	Mikie	Imagine	£8.95	—	November '86
7 (4)	Yie Ar Kung Fu	Imagine	£9.95	£12.95	March '86
8 (10)	Tennis	Bug Byte	£2.99	—	September '86
9 (–)	Jack Attack	Bug Byte	£2.99	—	September '86
10 (–)	Gauntlet	Micro Power	£6.95	—	—

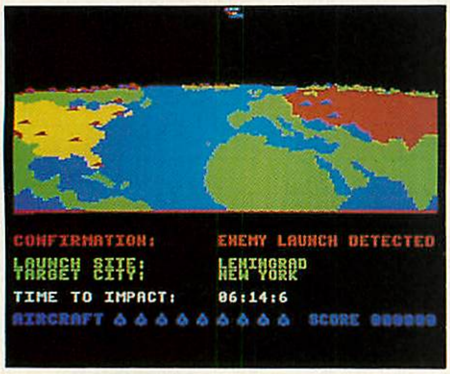
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REVIEWS

GAMES

BACK IN THE USSR



'Raid Over Moscow'; US Gold, Electron and BBC micro; £9.99

The Russians have been at it again! A Soviet missile attack has been launched at the cities of the United States. The whole of the Western World faces obliteration unless you, as controller of the last fighter squadron, can penetrate the Russian defences and stop the attack. This is the delight awaiting you in US Gold's *Raid Over Moscow*.

Initially the screen shows a world map just as the rockets leave their launch pads somewhere in the USSR. You must immediately enter an orbiting space station to launch your fighters.

Actually launching a plane is a lot easier said than done as the normal laws of earth gravity do not apply here.

Once you start a plane moving the only way to stop it is to turn through 180 degrees and fire your thrusters — not for too long though, or you start to drift back the other way. Until you become experienced in this the planes lurch drunkenly around the hangar and launching one becomes a game in itself!

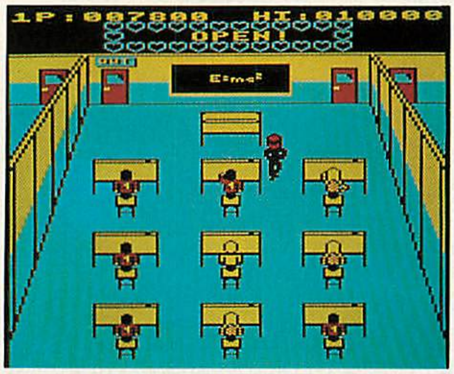
When launched, you have to fly along slalom fashion through Soviet airspace avoiding the various obstacles and the enemy planes. This continues until you reach the Soviet missile silos which must be destroyed before you can get at your main objective — the Soviet defence centre. As you may expect this is heavily protected by guards and tanks. If you manage to overcome these then you finally reach the Soviet nuclear reactor, guarded by killer robots, or course! Destruction of this will stop the missiles which, even as you play, have been advancing on their targets.

The whole game is played in real time and you only have about 5 to 7 minutes to stop the attack.

If all this sounds difficult, well believe me it is. *Raid Over Moscow* is one of the most challenging games I have seen for the BBC micro in a long time. This, added to the superb three-dimensional multi-screen graphics, produces a first-class game.

Mike Ginns

HIGH SCHOOL HEARTBREAKER



'Mikie'; Imagine Software; Electron and BBC micro; £8.95

Mikie began life as a successful arcade game; I've been playing one of the home micro conversions on my Electron. It's also available for the Beeb, but, unfortunately, not on the same tape. And it is obviously a conversion, since, although the graphics are a sophisticated copy of the original, using a 3D effect reminiscent of *Pedro* (need I say more?), programmer Peter Johnson hasn't made the most of the Elk's facilities. For example, although the inlay card promises a bell and music, there's neither. Worse, the program takes ages to work out what to do next — when you lose a life, for example, there's a frustrating pause, a pathetic beep, and, if it's your last life, a further pause of several seconds before things are reorganised for a new game. The promise of music isn't the only inaccuracy on the inlay card: we're also promised five lives, but only get three.

Yet, somewhere in this program, there's an entertaining game trying to get out. Pity it's so hard to get at. Its theme is to guide hero Mikie through a series of rooms in his US high school, collecting hearts as he goes, in classroom, locker room, corridor, gym, and, finally, the schoolyard, where he spots his sweetheart and completes the game by giving her the message 'OK'. Progress, however, is hampered throughout by very persistent teachers, chefs and manic janitors.

I found playing *Mikie* a frustrating experience: it's sometimes difficult to tell where you are with the fancy 3D effect — very clever programming, no doubt, but it gives me a feeling of floating in space. It's also a very difficult game to play. In particular, the corridor scenes which join each of the main scenes seem unnecessarily difficult, and seem to me to rely as much on luck as on skill.

I wouldn't buy it, but what do I know?

Bernard Emblem

COMPACT COMPILATIONS



Revs: realistic Formula 3 simulator

Acorn has been working closely with the producers of some of the best-selling model B software and hardware and has published a list of games, utilities, educational, and business application software that is currently available for, and compatible

GAMES

with the new Compact. The full list is available on request from Acorn, but here is a brief resumé of the games.

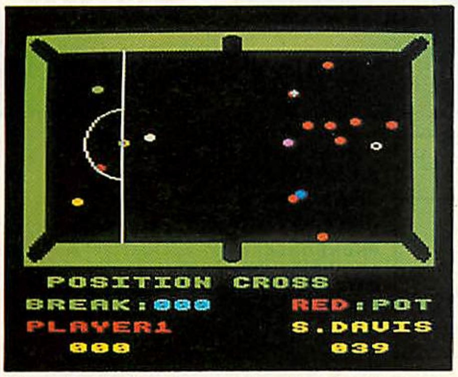
Many of Acornsoft's old BBC B games are going to be sold as compilations. *Acornsoft Hits Volume 1* contains *Magic Mushrooms, Planetoid, Rocket Raid* and *Maze. Magic Mushrooms* is a fast colourful



Winter Olympics: Tynesoft's success

ladder and platform game with the facility to design your own screens and save them to tape or disc. *Planetoid* is an excellent version of the Arcade game *Defender* in which you fly over a scrolling landscape defending humanoids and shooting everything else. In *Rocket Raid* you fly your spaceship through six different stages and try to destroy the mother ship. *Maze* is a three-dimensional maze. You must explore the maze, kill robots and find the three keys to escape to the next level.

Volume 2 contains *Starship Command, Arcadians, Meteors* and *Labyrinth*. In



Steve Davis Snooker: on cue for Compact

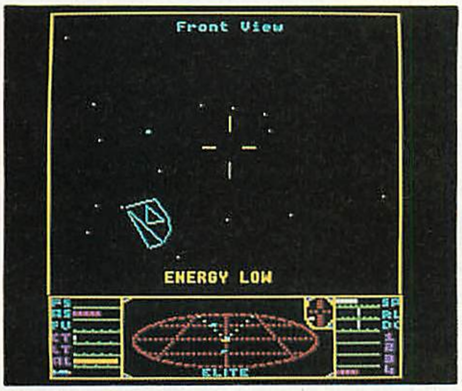
Starship Command which was the forerunner to *Elite* (see below), you are given a top view of your starship and simply have to shoot everything that comes towards you. Later in the game, some of the aliens are invisible and only appear when hit! *Arcadians* is like *Space Invaders*, but the aliens fly down to attack your ship. *Meteors* puts you in an area of space full of asteroids; you must destroy these and the ships that attack you, to stay alive.

Compilations are also being released by Micro Power and Blue Ribbon. These will sell for about £10 and will certainly provide a very good way to start your games' collection.

Acornsoft's best two games, *Elite* and *Revs* (including *4 Tracks*) are available separately. *Elite* is 'the ultimate space trading and combat game', the graphics are brilliant and the whole game is highly addictive and certainly won't be played once and forgotten.

If you know nothing about the game, then buy it and try it. If you do know it, buy it anyway!

If you like racing car simulations then you'll love or loathe *Revs*! It is a *very* realistic Formula 3 racing car simulator and is quite difficult to get the hang of, but



Elite: not to be played and forgotten

once mastered it is a realistic and challenging game.

The excellent range of recent Superior titles will also be available. This includes *Citadel, Repton 2* and *Karate Combat*, all of which were best sellers on the model B. *Citadel* is a large arcade adventure with fast colourful graphics and a good plot.

Repton 2 is a superb game and sequel to *Repton*. It involves running round a playing area much larger than the screen, eating earth and diamonds, letting the rocks drop, killing monsters and opening safes! *Karate Combat* puts you in an arena with either a computer-controlled or human adversary and you must endeavour to beat them using your karate skills! Prices for all Superior Software and Acornsoft games



Repton 2: Superior's large-scale challenge

have yet to be announced.

Tynesoft, a new company on the BBC micro games scene, has released a number of very good titles for the B and these are all going to be available for the Compact. If you like sports simulations, then *Winter Olympics, Commonwealth Games* and *Ian Botham's Test Match* are worth a look. Another of its games which is well worth buying is *Jet Set Willy*: this is a very good copy of the original on the Sinclair Spectrum. In the game you explore your mansion after a very successful party and you must collect all the glasses before your wife will allow you to bed! All Tynesoft titles cost £9.95.

For the chess fans, *White Knight 12* by Soft (£14.95), will give you a very good game for your money. Its predecessor (*White Knight 11*) won the Computer Chess Championship in 1984. (Mark 12 is an enhanced version of Mark 11.) It allows you to set up positions and can solve up to 'mate in 5' chess problems.

Both CDS and Squirrel market golf games. Don't expect too much and have a look at them before you buy. CDS's *Birdie Barrage Golf Simulation* costs £12.95 and *Super Golf* is available from Squirrel. If you're into snooker, then *Steve Davis Snooker* (£12.95) also by CDS may be for you. Graphics are fairly crude but acceptable, and there's no sound.

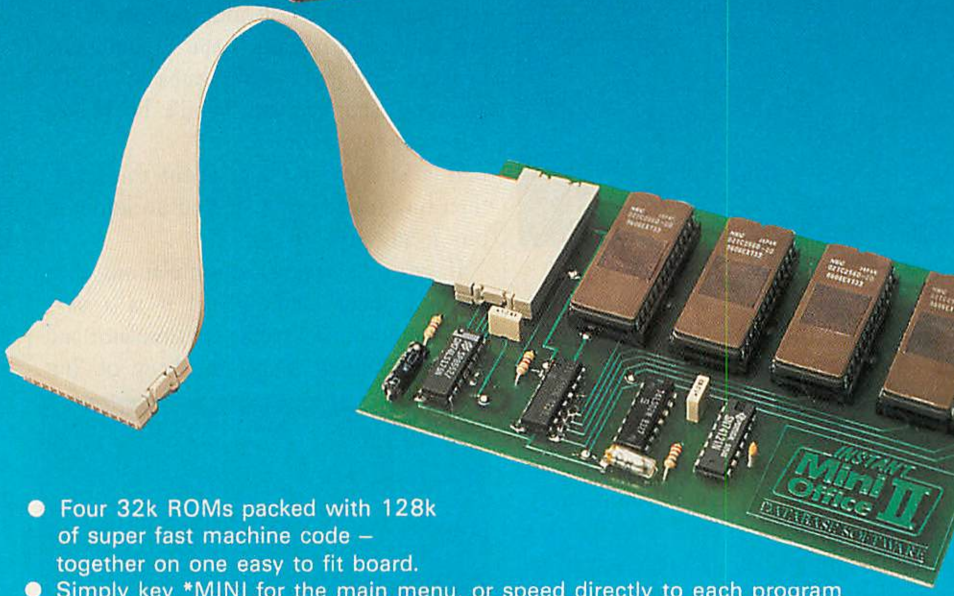
This list is not final or complete as most companies will convert their software to run on the Compact. Yet, it does provide a useful base from which to build your Master Compact games collection. If you are starting from scratch, I recommend you buy *Elite* and *Revs* plus the Acornsoft Hits or the Micro Power compendium.

David Lawrence

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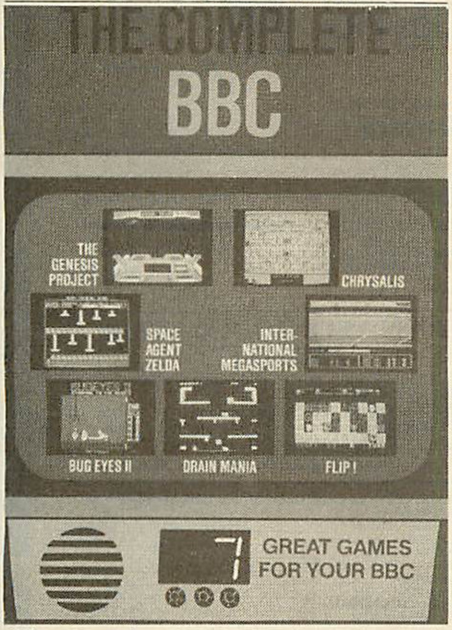
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GAMES

AN ARCADE OF YOUR OWN



'The Complete BBC', Audiogenic, £19.95 (two-cassette set), BBC B

In *The Complete BBC* seven arcade games are brought together into one action-packed collection, presented as a two-cassette set. The package boasts some well known titles as well as some original ones.

The first game you encounter is the *Genesis Project*. Here you look out from your space ship's cockpit on to a smoothly scrolling section of space. Into your view dart enemy ships. The objective of the game is to seek out and destroy six 'Cobolithium' devices which are scattered throughout the galaxy.

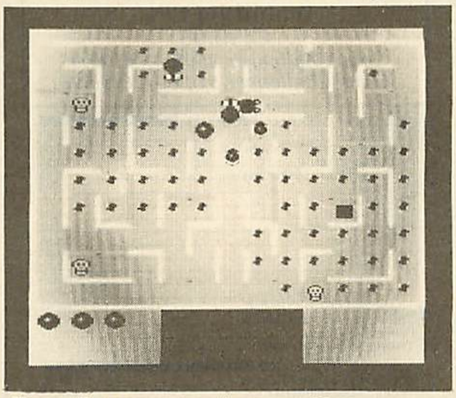
Unfortunately to destroy just one of these 'Cobolithium' devices requires more energy than you have available. This means that you have to keep nipping off to find an unsuspecting asteroid to destroy. The debris from one of these can be converted into more phaser energy.

The next offering is a memory game called *Flip!*. This is an original game played on a grid of squares. Behind each square is a tiny animated character. Players take it in turns to reveal two of the squares at a time. The object is to remember under which squares the various characters are and by doing so find a matching pair of them. There is also a word hidden beneath the whole grid. This is gradually revealed as more and more pairs are matched. The game continues until one player guesses the word hidden under the grid. The game is simple in concept but is surprisingly addictive in practice. The animated graphics, colour and musical tunes make it very enjoyable to play.

Chrysalis is a variation on the traditional *Pac Man* game. In *Chrysalis*, you run around a maze eating the eggs of the mutant worms which are chasing you. Failure to eat the eggs allows them to hatch into more worms which in turn lay more eggs and so on.

A nice feature of the game is that the maze contains a number of swing sections which can open or close off various paths through the maze. Careful use of these swing sections can give you the edge you need over your pursuers.

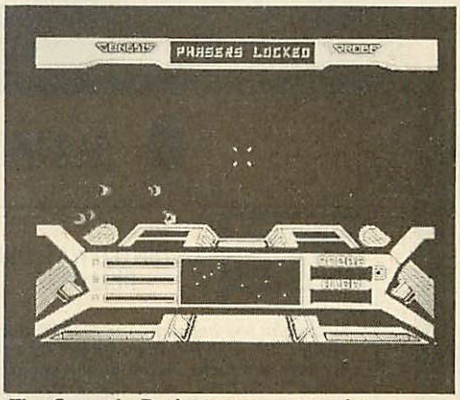
Drain Mania is the next game in the package. This is set, of all places, in a sewer. Your task is to move through the underground passages collecting gold coins. To hinder you in your search there are three sewer monsters which ooze out of pipes at the top of the screen and gradually move downwards. Contact with any of the sewer monsters is fatal, so you have to either avoid them, or kill them by head butting and kicking them!



***Chrysalis*: a worm-and-egg problem.**

Space Agent Zelda is a multi-screen game in which you must safely pass through all manner of traps and difficulties. Each screen presents a series of increasingly difficult tests. I managed to guide my character through the 'Stampy stompers', over the disappearing bridge and past the floating monster but after this I cannot tell you much about the game as I kept getting killed. A fiendishly difficult game.

If you still have any sanity left after *Agent Zelda* then try the sequel to it — *Bug Eyes 2*. The object of the game is to release Agent Zelda from her prison by collecting 25 keys, which are scattered around the strange landscape in which you find yourself. This must be done within a time limit and to further hinder you most of the keys are placed in awkward places where you have to risk life and limb to get them. There are also many strange creatures which must be avoided if you are to stay alive. Even Uncle Clive's C-5 makes an appearance!



***The Genesis Project*: energy-sapping.**

The scenery in the game, your character and the various nasties are all drawn on such a huge scale they really have to be to be believed.

The final game in the package is *Mega Sports*. This in fact consists of seven sub-games or events you can compete in and test your skills. For a start, there's a 100 metre sprint, skeet shooting, long horse, archery, a hurdles race, and both high jump and long jump.

There is nothing very new in *Mega Sports* and many similar games are available. However, it is very nicely implemented in this variation with excellent graphics, good sound and finishes off the package most satisfactorily.

Any package which offers seven games for under 20 quid must be good value. What makes *The Complete BBC* stand out is the quality of EVERY game in the package. In their use of graphics, animation, sound effects and game designs they are all very professionally produced. All of them could easily be sold as single games and in some cases this is exactly what has been happening.

In short *The Complete BBC* is a must for every self-respecting games addict!

Mike Ginns

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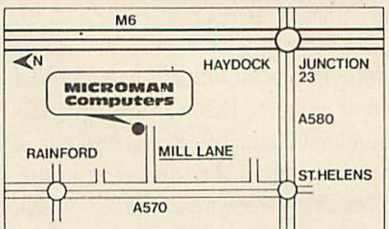
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ROM

A TOP-CLASS TOOLKIT

Mike Rawlings recommends ACP's Advanced Disc Toolkit

There are already many EPROM-based toolkits available for the BBC micro, so any new product has to be special.

The *Advanced Disc Toolkit* (*ADT*) has an impressive list of commands and is much more than a disc toolkit. Even more impressive is the claimed compatibility with all the BBC machines, including the Master, as well as the Electron.

It also works with a second processor active and is particularly useful in accessing input/output or sideways RAM areas.

The *ADT* comes complete with a 48-page manual which includes detailed fitting instructions for the Electron. Out of 34 commands listed, 22 are disc utilities, the rest being editing or informative commands. A number of standard Acorn commands are included with the intention of making all available from ROM (Acorn supplies different commands on disc depending on the machine). These are the standard DFS commands *BACKUP, *BUILD, *DUMP, *LIST, *TYPE which are missing from the ADFS, *FORM40, *FORM80, *VERIFY which are missing from the DFS.

In addition, sideways commands which are standard on the Master *ROMS, *UNPLUG, and standard ADFS commands *FREE, *MAP. All these are similar in action to Acorn's version except *FORM, which can be used to format any kind of Acorn-recognised disc plus a dual catalogue disc with a maximum of 60 files instead of 31. Some commands also have a choice of parameters which are not available on the original.

The various editing/dump commands can be used with the default parameters, or with a commendably flexible set of formats from disassembler to variable width hexadecimal or ASCII. The most impressive of the many possible options is the ability to edit memory (including sideways RAM) in disassembler mode.

The disassembler listing can not only be edited in hex or ASCII and scrolled backwards or forwards, but it is also possible to trace the logic of a machine code program by following a JSR or JMP or branch command, and then automatically return to the starting point.

```
*MDUMP 8C37 8C49 0 8
8C37 4C B9 FF  JMP OSRDRM          L9.
8C3A A0 00     LDY #&00             .
8C3C B1 70     LDA (&70),Y         lp
8C3E 60        RTS                 `
8C3F 70 04     BVS &8C45           p._
8C41 AD E5 FE  LDA SHEILA+&E5      -e
8C44 60        RTS                 `
8C45 AD E5 FC  LDA FRED+&E5        -e|
8C48 60        RTS                 `
```

Figure 1. How the listings are laid out

I particularly like the layout of the listing, (see figure 1), especially the use of Acorn's acronyms for the OS routines and registers. The disassembler also caters for the extended instruction set as found on the 65C02 (second processor) and on the 65C12 (BBC Master).

This kind of versatility is reflected in the way many of the other commands work. For example *MOVE can be used to move a block of memory from anywhere in memory to anywhere else in memory, including to and from sideways RAM as well as the second or I/O processor.

There are also a number of excellent string search utilities for Basic programs, memory, sideways RAM and discs. Unfortunately, Basic keywords can only be searched for by entering the token in hexadecimal, which has to be looked up in the user guide.

Disc files can be compared, copied or edited and discs can be read from, written to or edited sector by sector. In addition, there is an automatic disc menu and there are tape to disc or disc to tape transfer routines, as well as commands to display envelope and function key definitions.

Many of these commands are not so much toolkit commands as general utilities which can be incorporated into your own Basic or machine code programs. Particularly useful are the commands for moving blocks of data, especially for storing and retrieving screen memory or data in sideways RAM.

Different brands of sideways RAM use different methods of access. The Acorn-approved method is to use the ROM Select Register &FE30 for both read and write operations. The ADT uses this same technique and is compatible with both the Master and the B+128k, as well as *Acorn User's* own UserRAM, which conforms to the Acorn standard. The only other sideways set-up I am familiar with is the Solidisk system which uses the User Port Registers &FE60 and &FE62, and this too can be written to by inserting:

?&FE62=15:?&FE60=RAM bank number before the ADT command.

The manual is well laid out, but the exact syntax of all the possible parameters isn't always immediately obvious, and I found that several commands were more versatile than the manual admitted.

For example *FORM40 0 2 will format both sides of a 40-track disc while the manual states that this is not possible. Also *FCOMP will compare files in two different disc drives though this is not explicitly stated in the manual.

Over the years I have spent a great deal of time collecting a disc full of separate utility programs, some gleaned from magazines, others painstakingly written. This one package, that grabs only a few bytes of zero page and no other user memory, can now replace and surpass all these. The great advantage of the ROM-based *ADT* is that all the utilities are simultaneously available at any time.

Impressed as I am with the various editing routines, of greater value to me are the kind of utilities that can be incorporated in my own programs. I use my BBC micro for business as well as a hobby and could use this package to add extra facilities to the company software and easily justify the cost on commercial grounds.

The other major plus points are the comprehensive compatibility together with a sensible price. 16k of well thought out code for £34.50 is undoubtably value for money. I have no hesitation in recommending it to any serious BBC micro or Electron user.

Advanced Disc Toolkit, *£34.50*
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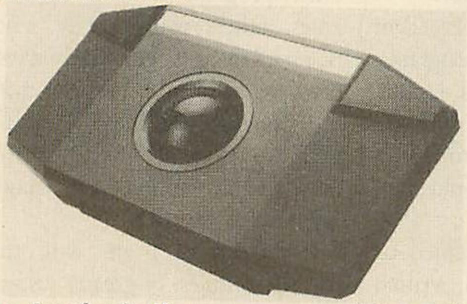
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HARDWARE

THE TOUCHSCREEN GOES TO SCHOOL

Touchtech 501 offers programs for all levels including severe learning and perceptual problems; by Chris Drage



Touchtech 501 offers children a fun way of learning and was very popular with autistic children

The Touchtech 501 is an input device that fits over the front of an M series Microvitec Cub monitor. It communicates with the micro via the RS423 port and is powered from the Beeb's 5v socket. The monitor sits on two feet which are attached at right angles to the bottom of the touchscreen with six screws. This also tilts the screen, making it comfortable to use.

The Touchtech 501 has a 6511Q microprocessor which detects when the screen is touched and responds accordingly. It sends out a pattern of invisible infra-red rays across the front of the host monitor. When these rays are interrupted by the finger or stylus the position is calculated by the touchscreen and passed to the computer program for action.

The Touchtech 501 has eight modes of operation:

Mode 0 — Data dump mode to check the correct functioning of the touchscreen.

Mode 1 — Returns x, y position of an object.

Mode 2 — Returns x, y position and size (width & height) of object.

Mode 3 — Returns four x, y positions of four objects. Mode 4 5 6 7 relate to modes 0 to 3 but return a stream of data instead.

To assess the potential of the Touchtech 501, I decided to place it in a class of autistic children in a special school in west London. The teacher immediately saw the advantages over the Beeb's standard qwerty keyboard and was keen to implement it.

Obviously, the success of the touchscreen depends largely on the availability of good software. The Touchtech 501 comes with a demonstration disc containing nine programs for use with the screen and others that allow you to convert Basic programs for use with the touchscreen.

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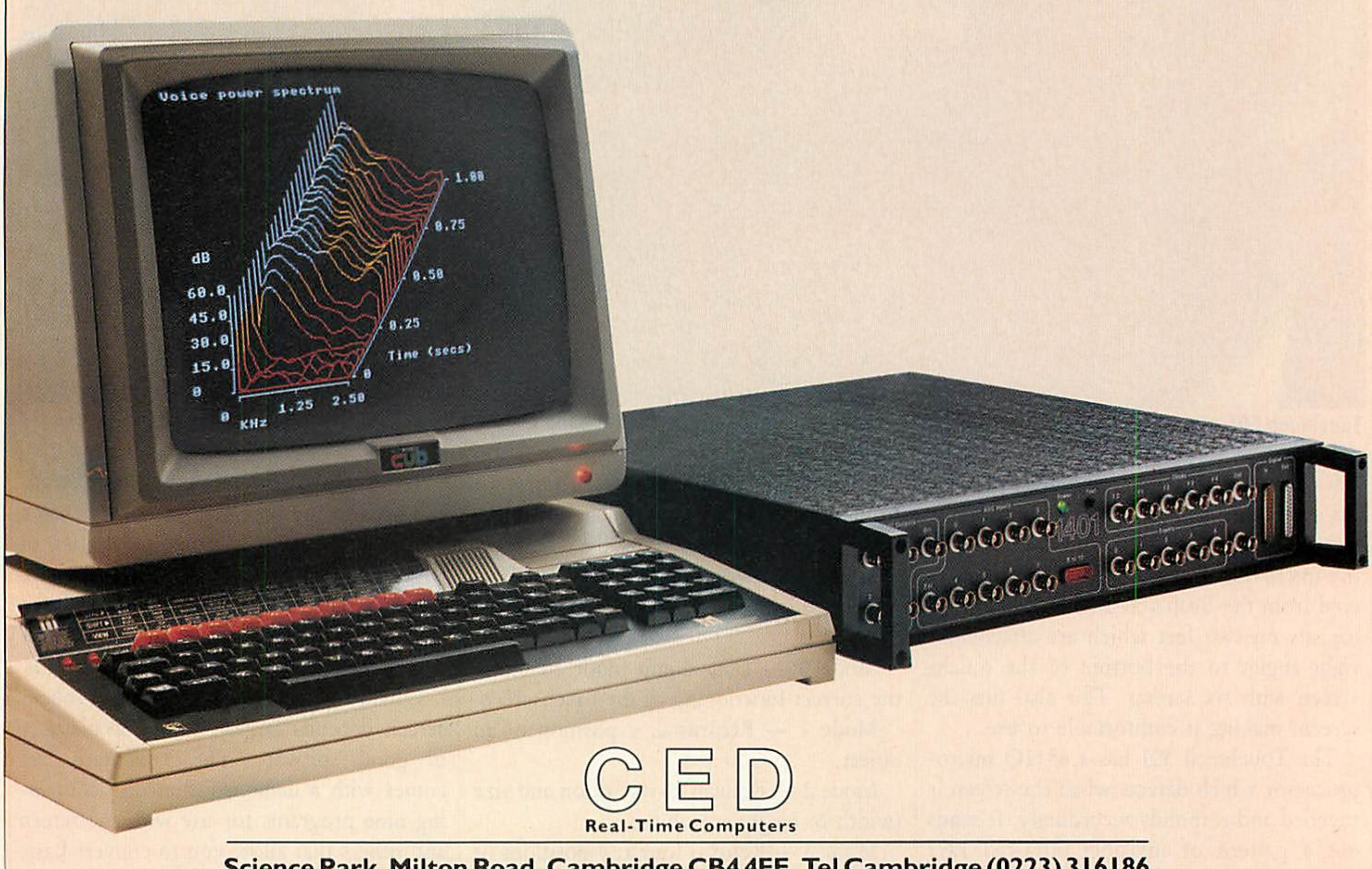
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HARDWARE

All the programs are extremely simple to use and even children with severe learning and perceptual problems were able to use them successfully.

The keyboard need only be used to boot the Menu program. From this point on all programs are run and controlled by touching the screen. Of the nine programs on disc, *Artist*, *Odd-man*, *Simone* and *Cubes* were favourites with the children. *Artist* is a rather limited touch-paint program demonstrating the stream mode of Touchtech. The youngest children really enjoyed this program. *Odd-man* (out) proved quite hard for some of the children as the differences in the pictures are quite small. As a point of interest I included Superior Software's *Speech* program into *Odd-man*, which delighted the children no end. *Simone* is a variation of the popular Simon sequencing game.

Cubes proved to be popular with the older children. This program allows the children to 'build' 3D landscapes with cuboids. Of all the software *Music* is the most developed. Unfortunately, the sounds produced are rather poor and it is quite complicated for young children to use. *Words* is an anagram type program which contains 13 words with clues to help the child. These programs serve to demonstrate the touchscreen's capabilities and, though useful, need further development to be of lasting value.

All the above programs were produced by MEP which has produced a second disc called *The Touch Screen Sampler*. This disc contains programs designed specifically to make use of the features which the Touchtech 501 offers, as well as programs developed originally for keyboard use but which also lend themselves well to use with the touchscreen.

The programs vary in style and content and range from pre-school to secondary age. They include games of strategy, a multiple point test program, an animated geometry program, a program that can measure the size of real objects and a multiple choice quiz. All the programs have been designed to encourage close involvement between the user and the activity by removing the distractions usually associated with the keyboard. The quality of the software is high.

The star of this suite is *Trace*, a letter formation program for infants. Although my version contained a bug, it is still a robust piece of software, immensely popular with the children. Another gem is *Cuppa* from Lincoln MEP. It is a sequencing exercise based on making a cup of tea. The delightful animated graphics are really appreciated by infants.



From music to animated geometry and 3D landscapes, Touchtech 501 is definitely a master

More programs are available from other sources including Microvitec itself, Megacycle Software, Micromate Software which is available from Toys for the Handicapped, and the Research Centre for Education of the Visually Handicapped (RCEVH), at the University of Birmingham. The SEMERCs are also producing software as are many LEAs.

However, the overall problem to date is that good software which really utilises the potential of the Touchtech 501 is still very thin on the ground. Software houses please take note!

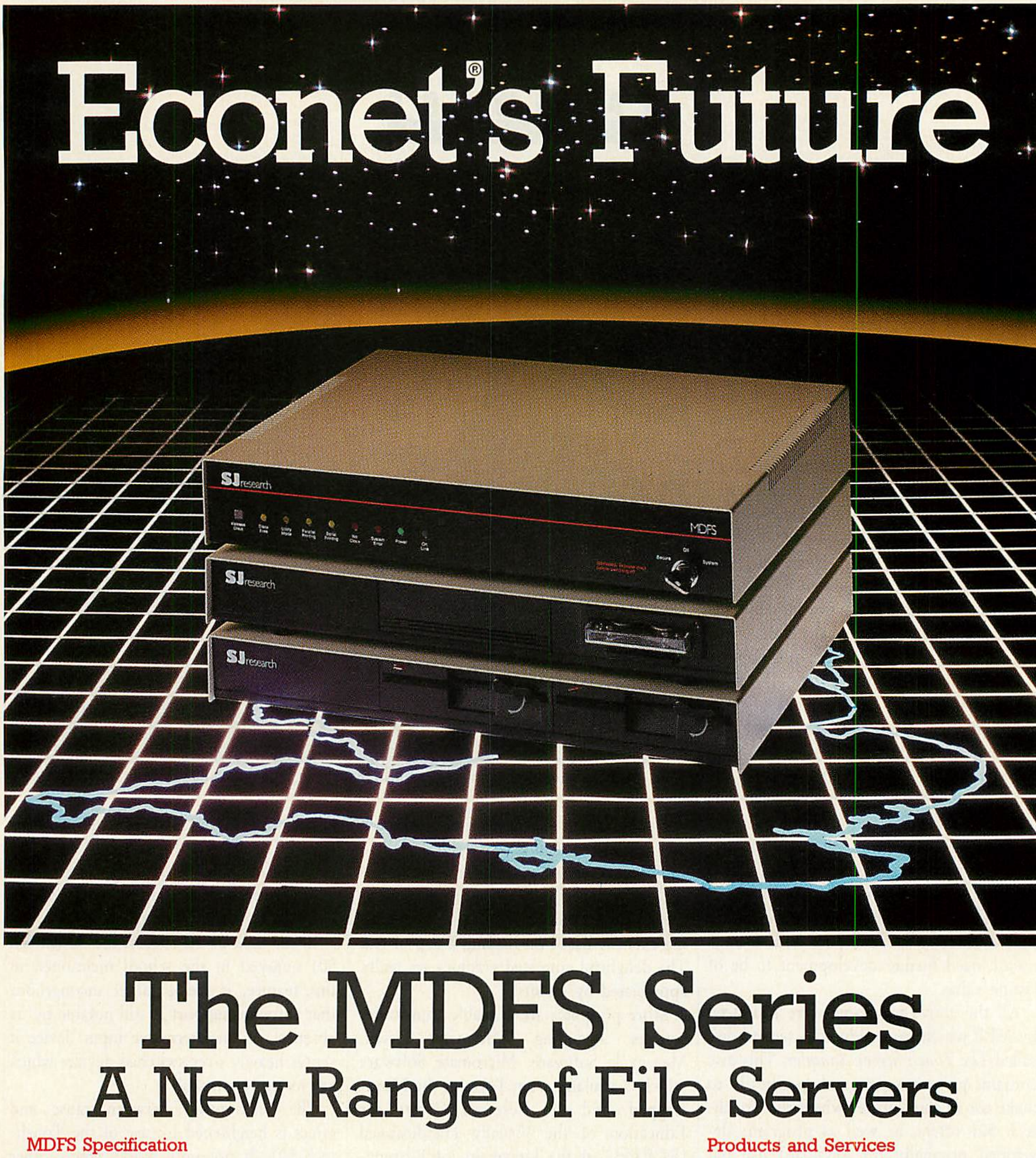
The teacher in charge of the children using the Touchtech 501 sums up his experience: 'The Touchtech 501 has been the most successful piece of hardware, apart from the BBC micro, to cross the threshold of our school. Even teachers and nursery nurses who have always been somewhat wary of the computer have taken to the touchscreen like ducks to water. The children love it and I have had to be something of a King Solomon to maintain peace and friendships! Even between some of the staff!!'

In the light of the success the Touchtech 501 enjoyed in the school mentioned in this feature, it seems rather incongruous that software support is still notable by its absence. As an alternative input device it scores heavily over switched devices which are its nearest rivals.

The relationship between cause and effect is heightened by use of the Touchtech 501. It not only works where other methods fail but works faster. Nor is its use limited to special education. Like the Concept Keyboard before it, there will be applications for the Touchtech 501 at all levels. Each regional SEMERC and MSU (ex-MEP) RIC has a Touchtech 501 available for demonstration.

In conclusion, the Touchtech 501 can be highly recommended to anyone involved in the field of education with young or special-needs children.

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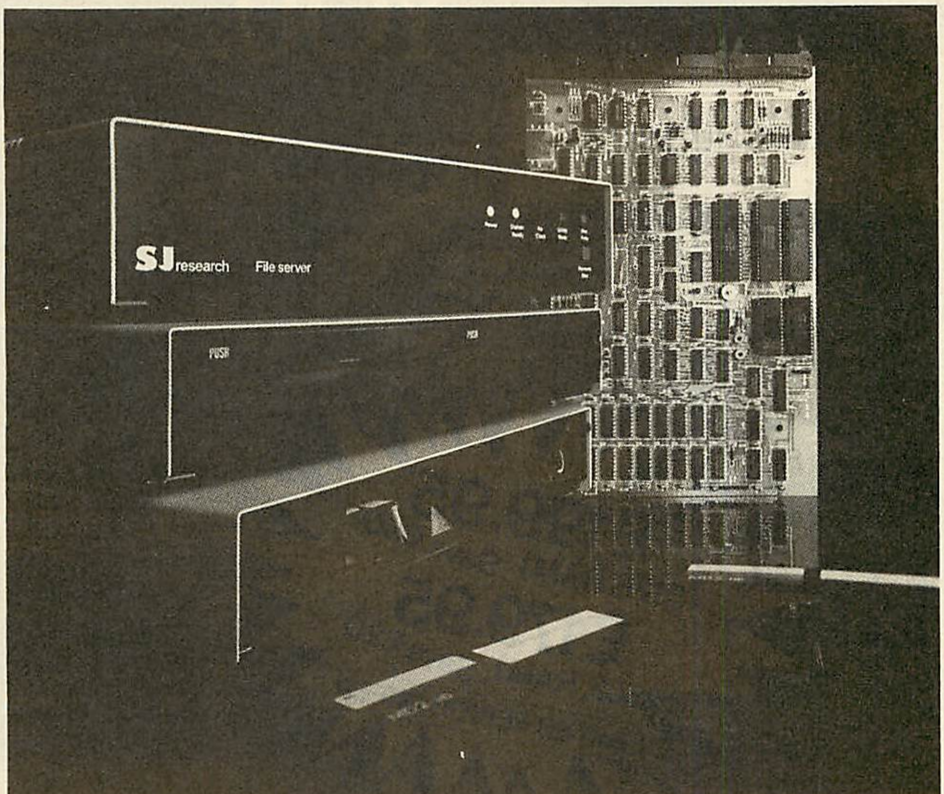
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HARDWARE

AN ALTERNATIVE TO ACORN

David Atherton evaluates SJ Research's Fileserver for Econet



SJ Research's FDFS Fileserver bundles everything into a box the size of two phone books

Having used Econet with Acorn hardware for some time now, my interest was aroused when *Acorn User* asked me to review the competition.

Econet, for those who have not used it, is a system where several BBC micros are cabled together, and all use one central disc drive or printer. There are two levels of Econet — Level 2, the floppy disc system, and Level 3, which uses Winchester discs (Level 1 is now obsolete). FDFS is a Level 2 system. SJ also produces MDFS which competes against Acorn Level 3.

Under the Acorn system, a BBC micro is dedicated to the task of 'fileserver'. This machine runs a special program which can deal with many requests for files at once from other machines on the network. The same machine can also be used to share the printer but it cannot be used for ordinary work. Due to the size of the fileserver software a 6502 second processor is also needed, and it helps to have a monitor to see what's going on. The FDFS fileserver from SJ Research replaces a BBC micro with network and disc interfaces, second processor, monitor and Acorn fileserver software with a single box about the size of a couple of phone books. Disc drives are not supplied but standard double-sided 80 track units can be used. The FDFS works with standard Acorn Econet hardware and software although SJ supplies an alternative to every Acorn item. You can get a complete package from SJ.

So, how do the systems compare? A drawback of Econet Level 2 is the capacity of the fileserver. The Acorn system uses a standard pair of double-sided 80 track drives, giving a total capacity of 800k. Unlike stand-alone machines, constant disc-swapping on a network can be a nuisance because you have to stop everyone working while you do it, and everyone has to start up again. This gets particularly difficult if someone is working through a long program and there will be popular programs and utilities which need to be copied on to every network disc. The FDFS solves this problem very nicely. It has sockets for *two* pairs of 80-track disc drives, and even better, works in double density mode. With two pairs of drives attached you instantly get 3.2 megabytes of disc storage, all accessible at the same time. The discs and drives are standard, but if that's not enough, you can buy special discs and drives from SJ which work at quad density, doubling the capacity to 6.4 megabytes. This alone is worth the extra money and you might like to compare the price with a 5 or 10 Mb Winchester system. In certain applications, a floppy system is more flexible than a Winchester, because, by exchanging discs, you have no limit on total capacity.

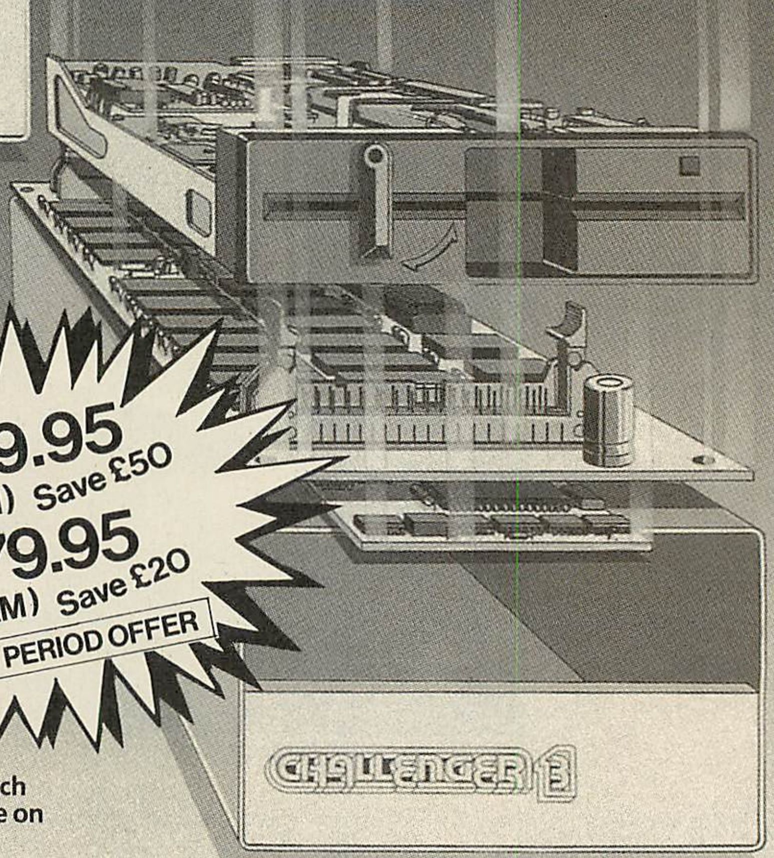
Documentation is supplied in loose leaf form in an A4 ring binder. SJ does this so that updates can be easily inserted. The documentation is very clear and very complete even if it does jump a little between friendly and academic styles.

Supplied with the FDFS unit is a disc, which contains fileserver code. Unlike Acorn Level 2 fileservers, the fileserver can

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Opus.

HARDWARE

be on the same disc as network files, which makes life a lot easier.

All the standard Econet commands such as ACCESS, BYE, DELETE, EX, INFO and so on are implemented, some with enhancements such as more time/date and ownership information, and multi-file deletion. There are also commands that the Acorn system doesn't have. Some are status related, such as listing of version numbers, system configurations etc, and there are useful routines to do autologon, to get time/date, user name etc into your own programs. SJ also supplies useful utilities such as a directory size measurer and a disc to network transfer program.

The printer server is fully catered for, with extra commands to check and alter the status of printer(s) on the network, and to set up files for printing later. Security on the SJ system is well implemented.

One of the biggest problems with Econet is the speed of BGET and BPUT operations, and any other commands, such as PRINT#, which use these calls. The reason is that, unlike DFS, the NFS does not provide any buffer memory, so each BGET call results involve access to the network. This makes these calls very slow. The new Advanced NFS on the Master solves the problem by allocating 256 byte buffers, like DFS, but for old NFS users, SJ has included a utility to provide buffers by routing BGET and BPUT calls through DSGBPB. This greatly improves speed of operation and software written for disc will work at an acceptable speed. This utility will not work if PTR needs to be moved.

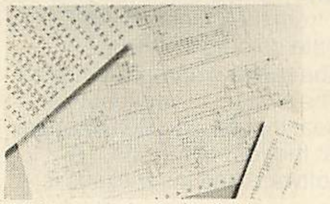
The FDFS costs about the same as the equivalent Acorn set-up, but is much better in many ways. Unless you already have a spare BBC micro and monitor to use as a fileserver, then for non-Winchester systems this is the one to go for.

	A	B	C	D	E	F	G	H	I
BBC FDFS	6.1	9.0	8.9	24.7	45.0	88.0	94.0	87.0	86.0
BBC FDFS+PUTGET	6.3	1.4	1.7	24.7	44.0	88.0	94.0	87.0	86.0
BBC Level 2	4.0	11.8	16.6	24.0	82.3	76.6	619.0	379.0	300.0
BBC Level 3	22.0	14.1	12.5	25.6	58.3	74.0	244.0	214.0	108.0
BBC DFS 1.2	0.4	2.1	2.6	3.5	12.0	180.0	220.0	3855.0	1458.0
Master FDFS	8.9	1.7	1.7	26.6	6.3	87.9	93.6	90.0	89.0
Master Level 3	21.0	1.8	1.8	33.2	9.3	76.3	235.3	227.0	126.0
Master ADFS	3.0	3.8	3.2	11.0	11.2	180.0	280.0	180.0	180.0

A Open and close a file 1000 times, B BPUT 1000 bytes to a file, C BGET 1000 bytes from a file, D 1000 of PTR=0: PTR=16383 on a 16k file, E INPUT# 1000 numbers, F*LOAD a 16k file 100 times, G*SAVE a 16k file 100 times, H Write 16k with OSGBPB 100 times, I Read 16k with OSGBPB 100 times.

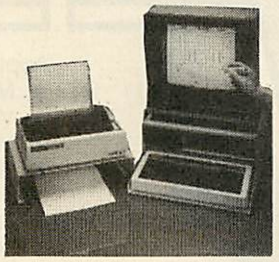
FDFS File server *£986 (£800 to education)*
Optional quad disc drives *£690 per pair*
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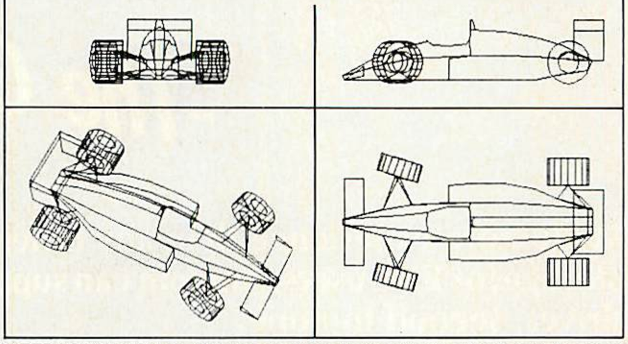
Our software is available for assembling machine code programs for the BBC micro itself (for which our 65C02XR rom is ideally suited) or for any of the other target processors listed below. It is compatible with the models B, B+ and Master 128 and with all DFS, ADFS and Econet filing systems. (Owners of early model B's should ensure that their computer is equipped with Basic 2).

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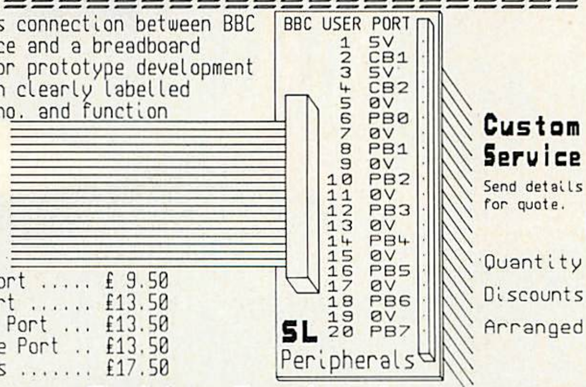
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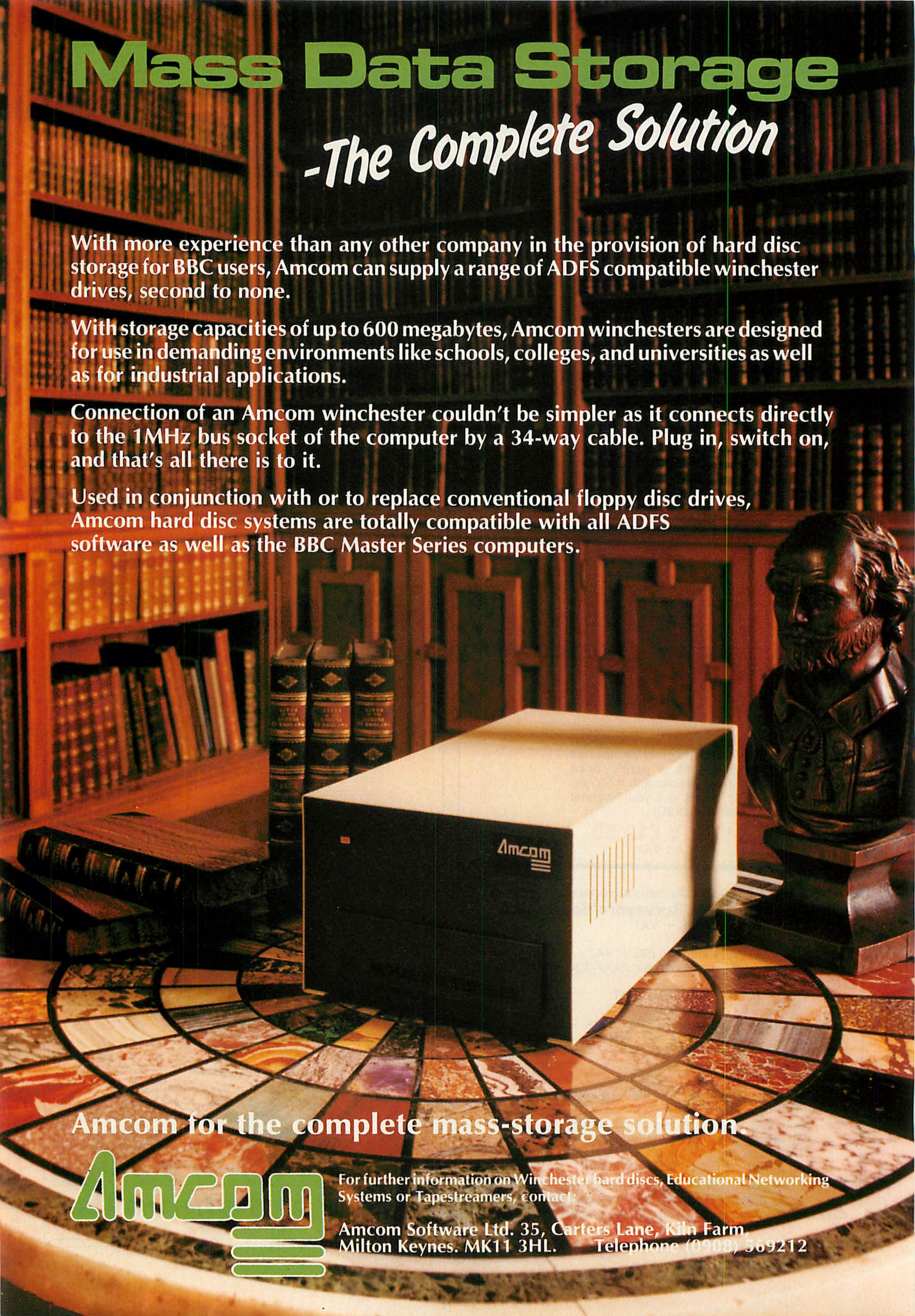
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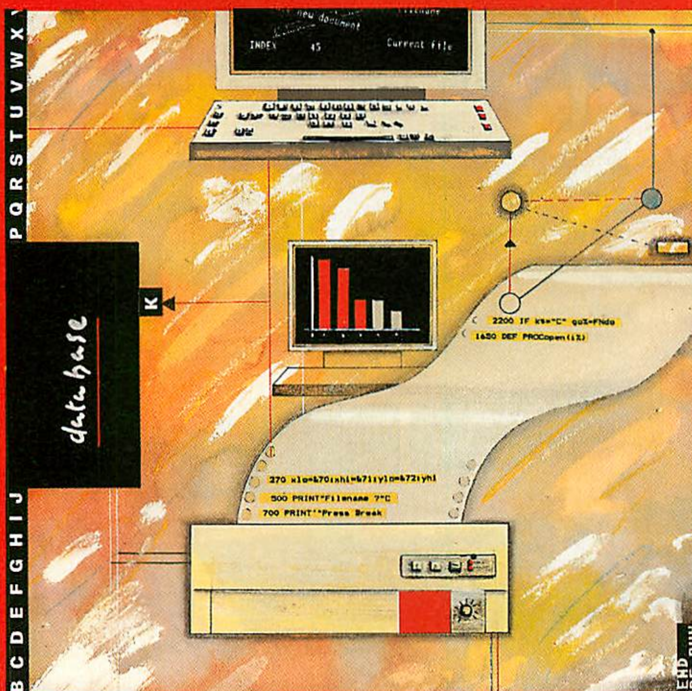
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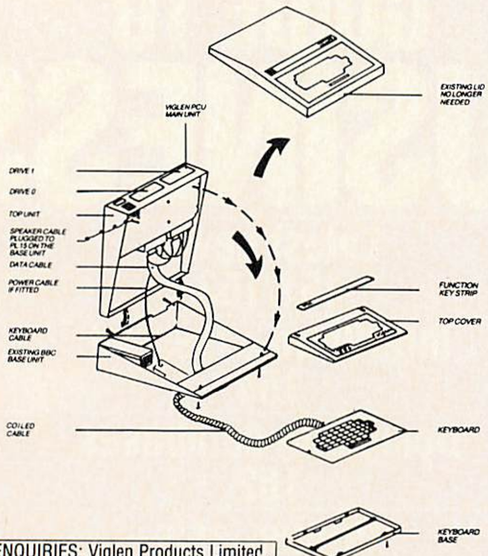


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BUSINESS

NEWS

Faster printers

Three new Silver Reed daisy wheel printers are available from distributor, Datamyte.

The EXP420 costs £267 and prints at 12cps. The EXP600 is faster at 25cps and costs £540. Top of the range is the £799 EXP800 capable of 40cps printing. Details from Datamyte, 52 Derby Street, Leek, ST13 5AJ. Tel: (0538) 383383.

Free gold

Miracle Technology is offering free registration (normally costing £40) for Telecom Gold to buyers of their WS4000 and WS3000 modems (£150 and £295 respectively). Details from Miracle Technology, St Peter's Street, Ipswich, IP1 1XB. Tel: (0473) 216141.

New databases

Telecom Gold is providing access to more information databases. Jordans and Infocheck provide financial information on UK companies. Access costs £2 and £2.50 per minute. AIMS provides government policy and assistance program news and costs £1.67 per minute. Telecom Gold, 60–68 St. Thomas Street, London, SE1 3QU.

Micro protection

Philips has released a range of units to protect micros from mains spikes. The PE1411/20 has two mains outlet sockets to cope with equipment rated to 200 watts and costs £205. Higher power models are also available. Contact Pye Unicam, Enquiry Section, York Street, Cambridge, CB1 2PX.

Compact software

by Geoff Bains

Acorn's Master Compact micro was launched with many business software packages ready to run. Acorn is hoping the Compact's similarity to the Master 128 and the compatible software will re-establish Acorn in the business environment.

Surprisingly, most of Acorn's own *View* family is not yet available in Compact-compatible versions. *ViewStore, ViewSheet, ViewSpell, ViewPlot* and the *View* Printer Driver Generator will all be available on disc 'before the end of the year', said Acorn's Mark Jenkins.

Alternative software is available now. Computer Concepts' *InterSheet, InterChart* and *InterWord* are all compatible as is *Wordwise Plus*.

BBC Soft's *Ultracalc* spreadsheet ROM functions. Clares' *Beta-Base* is available on 3.5in disc for the Compact and so are *Quickcalc* and *Masterfile II*



from Beebugsoft. Accounting software is provided by Meadow Computers' *Micro-Trader, Micro-Stock* and *Micro-Mailer*, Peartree's *Profit* and Squirrel's *VAT Care*.

Both AMS's *Pagemaker* and Mirrorsoft's *Fleet Street Editor* operate on the Compact. The AMX mouse, like the Megamouse from Peartree and the Digimouse from Nidd Valley will operate on the Compact but require a different plug. Both AMS and Peartree are planning a Compact mouse.

Although *View* is supplied with the Compact on disc, for loading into sideways RAM, other software houses are keeping to the ROM format for their sideways software. BBC Soft's David Atherton said as the Ultracalc ROM works on the Compact, he 'could see no reason to change it'.

Software houses are finding problems with the 3.5in discs used on the Compact. The extra cost of these discs means price rises. Beebugsoft has added £1 to *Quickcalc* and *Masterfile II* and Clares has added £2 to disc prices.

Details of the Compact available from Acorn on (0223) 245200. Details of compatible software from Computer Concepts: (0442) 63933, BBC Soft: 01-580 5577, Clares: (0606) 48511, Beebugsoft: (0727) 40303, Meadow Computer: (025 682) 2008, AMS: (0925) 413502, Mirrorsoft: 01-377 4745, Peartree: (0480) 50595, Nidd Valley: (0423) 864488.

Small business support group

Small business users having trouble combining technology with commercial needs, now have a helping hand. The Small Business Support Group offers a range of services for small businesses. The SBSG aims to support users of word-processors, spreadsheets, databases, electronic mail, stock control, accounts and payroll.

The group is designed for users of all types of micro and organiser Jane Davis said BBC micro owners are very welcome. The membership fee to the SBSG is £40 a year.

A phone helpline is provided for members, with experts on hand between 9.30am and 5.30pm to answer urgent problems. The group publishes a bimonthly newsletter with reviews, hints and tips, topical articles and members' letters. More publications are planned.

Training courses run by the SBSG's parent company, Microcomputer User Publications, are available at 10 per cent discount Compilation discs of public domain software are being produced for sale to members at a nominal price and commercial applications will be available from Microcomputer User Publications.

The membership fee includes free registration with the One-to-One service offering electronic mail and telex.

Details from the Small Business Support Group, Bank Buildings, Kennel Lane, Broadway, Worcs.

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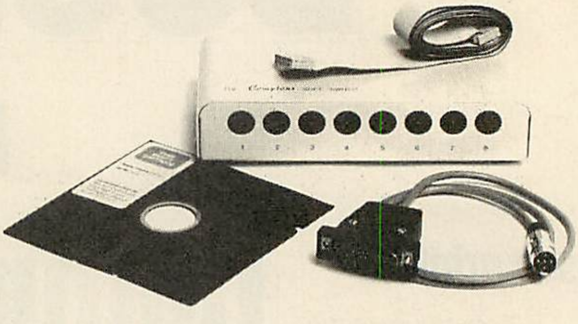
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Typesetting problems overcome

Producing printed documents with a BBC micro has been made easier by Type City Graphics. The Wordstream system allows users to prepare text using their own wordprocessor and send it to Type City Graphics via One-to-one electronic mail. Type City claims the camera-ready typeset copy is produced within an hour and dispatched back by post the same day. Proof copies of typeset material can be returned by facimile in minutes.

Wordstream offers 155 typefaces in a wide range of sizes, accents, special characters and rules and graphic symbols.

The typeface and size to be used and other typesetting information are determined by control codes of letter and number combinations, inserted into the text.

The cost is determined mainly by the length of setting paper used. Wordstream charges £2.34 per foot plus 30p postage and 10p per thousand characters for material received via electronic mail.

Details from Wordstream, Type City Graphics, Victoria Chambers, Fir Vale Road, Bournemouth BH1 2JN.

Users risk prosecution

by Geoff Bains

Around 150,000 computer users are risking criminal prosecution estimates Francis Aldhouse, the government's Deputy Data Protection Registrar.

These are the users who did not apply for registration under the new Data Protection Act before the deadline in May. Of the 130,000 users who applied only 30,000 applications have been processed. Around one in 12 applications received were incorrectly filled in and so not processed and a further 30 per cent raised queries.

Everyone with only certain exceptions, using a computer to store information on living individuals must register. Failure to do so risks prosecution.

Private individuals holding information for their own private use are exempt. Unincorporated members clubs and some payroll and mailing list databases are let off the hook if certain conditions are met.

Francis Aldhouse recommends that any computer user with stores of data on people should read the Registrar's guidelines and then, if in doubt, apply. Users who have not applied before the deadline should not be 'afraid of applying now' and applications are 'better late than never'.

Application for registration costs £22 and covers a three year period. Contact the Office of the Data Protection Registrar, Springfield House, Water Lane, Wilmslow, SK9 5AX.



Oak Universal's PCM series is based on the Acorn Master

Acorn to Oak

Oak Universal has launched a new range of repackaged BBC micros based on the Master series. The Oak PCM series are packaged with disc drives and main board in a system box with a detached keyboard.

The PCM M is the equivalent to the Master 128 and supplied without disc drive. It costs £569, around £70 more than the Master 128 and the dual 80 track drive version retails at £884.

The PCM Mt range includes the Turbo Co-processor board and prices start at £684 for a system without drives. The Z range, containing Acorn's Z80 second processor retails at £1351 for a twin drive system to £3444 for a system with a 40Mb hard disc.

A scientific range is also available, using the Acorn 32016 second processor with 512k RAM. Prices start at £2984 for a twin drive system. The Communicator range features a built-in modem.

Contact Oak Universal, Cross Park House, Low Green, Rawdon, Leeds LS19 6HA.

BUSINESS TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	B+	Master	6502	Econet
1	Mini Office 1/2	Database	£14.95	£16.95	—	—	Yes	—	No	—
2	View/View 3	Acornsoft	—	—	£89.70	—	Yes	Yes	Yes	Yes
3	Office Mate	Gemini	£12.00	£12.00	—	Yes	Yes	*	No	No
4	Database	Gemini	£19.95	£23.95	—	—	Yes	Yes	—	—
5	Desk Diary	Acornsoft	£6.99	—	—	Yes	—	—	—	—

Compiled by Gallop/MicroScope. *Contact publisher: Database Publications, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411. Gemini, Gemini House, Dinan Way, Exmouth EX8 4RS.

FANFARE FOR INTERWORD

Computer Concepts' much-heralded wordprocessor has finally hit the shops – was it worth the wait?

Bruce Smith and Tony Quinn

Few pieces of software have arrived with such a prolonged fanfare as Computer Concepts' new wordprocessor, *InterWord*. Readers of the news pages will have known of its pending release for many months: it promised pull-down menus as well as many of the nice features of those Computer Concepts' foundation stones *Wordwise* and *Wordwise Plus*.

The waiting is now over and *InterWord* is with us. The question is, has it been worth waiting for and how does it square up to *Wordwise Plus* and to its biggest rival, Acornsoft's *View*? I've been playing around with the package for a couple of weeks so I will be passing on my thoughts over the next few pages, and Chairman Tony will be putting *InterWord* through the Quinn wordprocessor benchmark – can he use it effectively without the manual?

What you get

InterWord is a 32k ROM of which all but three bytes have been used. It is compatible with the BBC B, B+, B+128, Master 128 series and the new Master Compact. Now, inserting a 32k ROM into one of the BBC's ROM sockets is not possible simply because the maximum capacity of a ROM slot is 16k. To get round this limitation the *InterWord* ROM is mounted piggyback style on a very small circuit board holding a couple of chips that enable the whole 32k address range to be addressed in the 16k ROM slot.

The board has been well produced so that it sits in a slot slightly proud of the other ROMs about it, without encroaching on any other ROM's territory.

Fitting the ROM is perhaps easier than fitting a more conventional chip: you have more to get hold of and the pins are much more robust. However, repeated insertions would almost certainly have a detrimental effect on the ROM socket – so once it's in place it is best left alone.

An 80-page manual is supplied and reading through this provides you with the basic skills for using *InterWord*. A four-page supplement supplies the real tips on using *InterWord*. A fold-out quick reference card shows the contents of each of the pull-down menus – an invaluable aid which must sit permanently on your micro if you are not to be left looking through menus for a particular function. A function keystrip completes the package.

INTERWORD MENUS

Status Menu: Provides you with information such as word count, bytes free, bytes used and filename. It also includes a list of other menus which can be selected from here.
Preferences: Allows default settings to be changed such as columns as well as the screen colours.
Marked Section: Allows sections of marked text to be moved, copied, deleted, underlined, emboldened, dotted, aligned left, aligned right, centred and justified.
Search and Replace: Search and replace strings can be entered. Case sensitivity and confirmation of a change can be set as required.
Page Layout: Allows paging to be turned on and off. Page layout can be defined, ie lines per page, top and bottom spaces, header and footer numbers.
Printer Setup: Contains options for the handling and printing of test, ie number of copies to be printed, number of columns, printer type, column indent, etc.
Control Codes: Defines printer control codes for all special effects including pre- and post-print options.
Multi-File: Gives access to the multi-file list which defines order of files in a document. A new list can be created and files can be added or deleted from the file list, or alternatively printed out.
Spelling Checker: This will give access to the *InterWord* spelling checker when it is available.
ROM-Link: Gives access to all other defined *Inter* packages.

Into InterWord

Typing *IW. puts you into *InterWord* and the now familiar Computer Concepts menu screen. It's similar to the *Wordwise Plus* menu, but the Segment Menu option is missing and Option 5 is different. This gives you direct access to the Printer setup menu, also available from text mode.

Pressing the Escape key puts you into an 80-column text mode (see screenshot) where you are presented with a black screen showing a ruler at the top and curious cross-hatching on the lower half of the screen below the text cursor. This shows the 'space' remaining for text on the current page. There is no facility to switch off the cross-hatching, but I find it quite a nice touch and preferable to looking at a blank screen. However, several people have commented that it makes them boss-eyed, so for some it may take a little getting used to.

The ruler

The ruler occupies two screen lines. The top line shows where the left- and right-hand margins of your text are in relation to the paper – which is effectively the screen. These margins can be moved to set the line length and position: move to either margin and drag it along with the Shift and cursor keys. This has the same effect as the embedded/edit commands LM and LL in *Wordwise* and *View*. Also included on this line within the ruler are the tab stops which appear as stout Ts. These can also be set to the required position by dragging them along. (In *View* this is done by setting *'s at the appropriate point in the ruler and in *Wordwise* the actual column positions must be placed in an embedded command.)

The bottom line of the ruler contains the character stops across the screen and a return arrow on the right-hand side. This too can be dragged right or left and marks the position to which the cursor will go on the next line when the Return key is pressed – thus giving an automatic paragraph indent facility.

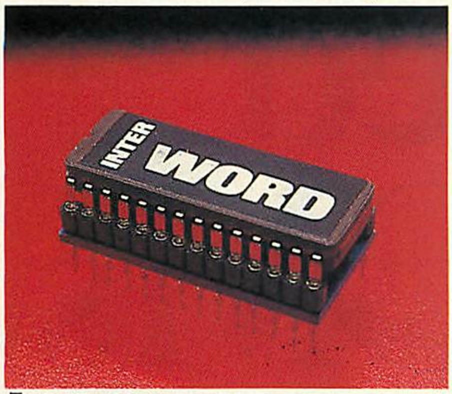
Like *View* (but not *Wordwise*), *InterWord* allows you to include rulers throughout your text so that the layout can be changed as required. Although the *InterWord* ruler takes up two on-screen lines this has no effect on your printed page length – the ruler, as with *View*, is transparent.

Inserting rulers is done with a single function key press (as opposed to CTRL – f8 in *View*) and the default ruler is inserted at the position of the cursor. The ruler can then be edited to suit your requirement at that

point. There's a subtle difference here between a *View* and an *InterWord* default ruler. *View* will give you a rule that is always the same, ie spans the entire screen, whereas *InterWord* will copy the last defined ruler.

WYSIWYG

InterWord is a true example of a 'What You See Is What You Get' (WYSIWYG) word-



I*nterWord* is a 32k ROM. To allow it to fit into a single ROM slot it is mounted on a specially-designed board which also contains some smart elecronics

processor. Each change you make to your text or the way your text is formatted is shown on the screen. *View* is only semi-WYSIWYG as several of its edit commands only have an action when you either preview the text with SCREEN or print it out to the printer. However *InterWord's* WYSIWYG only lasts while you have enough memory to display your text. While in 80-column mode on a normal unexpanded BBC B, *InterWord* uses 20k in mode 0, leaving 4798 bytes free for text (about 800 words). To maintain 80-column mode *InterWord* will try to switch down to mode 3 to maintain 80-column mode freeing 4000 characters for text. When this limit is reached more memory can be gained by opting to work in a 40- or 53-column mode, which frees a further 8300 characters. The WYSIWYG is still there – but not all on the screen at one go. Instead, the screen acts as a window on the sheet of paper (rather like a spreadsheet). Even so, an 80-column mode can be maintained by using the multi-file facility provided which is discussed below.

If shadow memory is available, this solves all problems in a single stroke and 25,278 bytes are free immediately in 80-column mode. Being 32k long, *InterWord* will not run across the Tube in a 6502 second processor. Like *InterSheet*, *InterWord* also has a 106-column mode available. But the character definition on my medium resolution monitor was such that it wasn't a workable proposition.

To prove even further that *InterWord* is a true WYSIWYG, it also allows a degree of printing effects on screen. For example, if you wish to use bold, underlined or dotted underline text on your printer, you can select these effects via a Shift-function key combination and the text is shown as bold or underlined on screen.

Menus

The *InterWord* pull-down menus all work very well. There are 10 in all and they can be accessed in two ways: either by pressing a CTRL-f key sequence or by making a selection from the main Status Menu which is obtained by pressing f0. Menus can only be accessed from text mode.

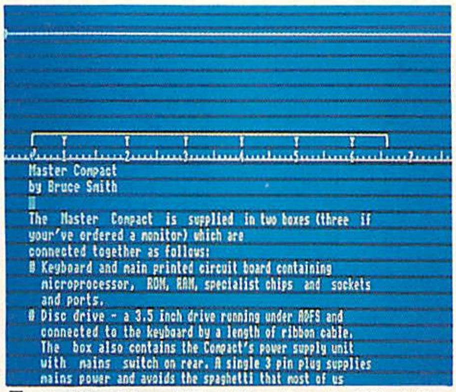
Selections from menus are made in one of two ways.

First, the cursor keys are used to move an inverted bar down through the options and then the Return key is pressed to select the chosen option (perhaps after having entered some text).

Secondly, where there is a limited range of choice, *InterWord* will normally let you step through the possible options using the left and right cursor keys, then press Return to select what you want.

The screenshots show of some of the menus, with a brief description of each.

I found the menus very easy to use, once I had found my way around them, and it's



I*nterWord* is a What You See Is What You Get (WYSIWYG) wordprocessor. Note the Ruler and the fact that page breaks are also shown.

here that the quick reference chart comes in handy. But using menus to perform certain tasks does result in more keystrokes being required, so there is a trade off between presentation and quickness of use, certainly in the learning stages at least.

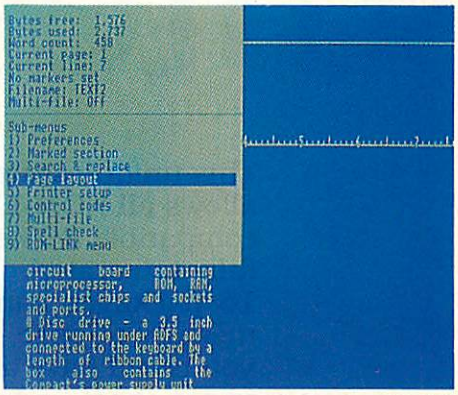
Manipulating text

Like *Wordwise* and *View*, *InterWord* allows you to mark sections of text which you can then manipulate in a variety of ways, ie, move, delete, copy, save, print and preview. Surprisingly, *InterWord* is still limited to just two markers – like *Wordwise* but unlike *View*, where up to six are allowed.

When a section of text is marked it is inverted out of the background colour. Text can be deleted or copied using the Marked Section Menu or else more directly by pressing either f8 or f9. As with *Wordwise*, but unlike *View*, if you wish to delete a largish section of text a safety net requests that you answer 'Y' in response to an 'Are you sure?' prompt.

No single function key is provided to simply move a marked section of text (this is provided as a menu option), but copy (f8) followed by delete (f9) has this effect.

Markers must also be used if you wish to



The Status menu provides you with full information on the document currently in memory. The other sub-menus may be selected using the bar.

embolden or underline a section of text. The text is marked and the required Shift-key must be pressed.

One idiosyncrasy is that the cursor must be within the bounds of the marker when this is being used otherwise the desired effect will occur on the text below the cursor up to the next return character.

Various CTRL key combinations allow manipulation of letters, words or text and these are listed in the box on page 159. The Copy key is defined so that it deletes in the opposite direction to the delete key, ie to the right, which is most useful (and not unlike the action of f9 in *View* – which deletes the character at cursor).

Deleting lines of text with the Delete key held down can be rather confusing. As *InterWord* is working so hard to delete the text it sometimes forgets to update the screen which can mean that you leave a trail of deleted text on the screen – until you release the Delete key and give *InterWord* a chance to catch up.

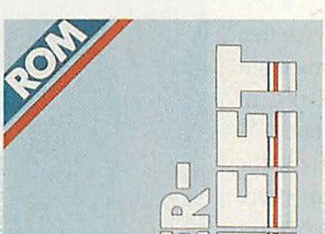
Text may be positioned on screen in one of four ways: aligned left (normal), aligned

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This unique system allows all ROM-LINK compatible ROMs to be fully integrated. Up to 16 'packages' can be held in memory at once, so for example you could have a spreadsheet and a chart and a document in the word processor all being worked on at the same time. The ROM-LINK system also allows any data to be transferred directly from any package to anyother. For example spreadsheet data could be imported into the word processor, and then back again into the spread-sheet, then into INTER-CHART to plot a graph.









* TO BE RELEASED SOON

FOR THE BBC MICRO

Computer Concepts

The Master Compact Compatible

INTER-WORD

The latest word processor from the same stable as WORDWISE and WORDWISE PLUS, the most successful programs ever written for the BBC Micro computer. With years of experience and feedback from users, the authors of INTER-WORD have ensured that it suits everyone's needs. A great deal of attention has been paid to ensuring that INTER-WORD is fast, efficient and above all simple to use. Being menu operated the newcomer does not need to remember strange key combinations or command names. The menus are not a burden to the experienced user since there are shortcuts to access many of the features.

REVIEWS

"the most significant program since WORDWISE." ... "INTER-WORD on the BBC Micro compares favourably with word processors costing five or ten times as much on the IBM PC and the like." ... "INTER-WORD is a real pleasure ... a truly worthy successor to WORDWISE"

Gordon Taylor A&B Computing

"Rulers can be used to manipulate text to your satisfaction. This is a joy to use."

"INTER-WORD is certainly an advance on most other word processor packages."

Popular Computing Weekly, July '86

Technically, too, the program is astounding ..."
"... quite stunning handling characteristics"

Viewfax Tubelink—August '86

"INTER-WORD is the most powerful and comprehensive word processor available for the Beeb today. It is more powerful and flexible than View and still retains much of the friendliness and ease of use of Wordwise. Inter-Word looks set to become the standard word processor for the BBC Micro."

Beebug, Aug/Sept '86

Some of its special features are:

•Automatic re-formatting
This enables the user to just type - no keys to press to re-format the paragraph after changes to the text or margins have been made; the margins on the rulers can simply be dragged, all text being instantly re-formatted to the new settings.

•Multiple documents in memory.
Most people do not work on one document at a time. INTER-WORD allows up to 16 documents to be stored in memory at once, and text to be transferred from one to another.

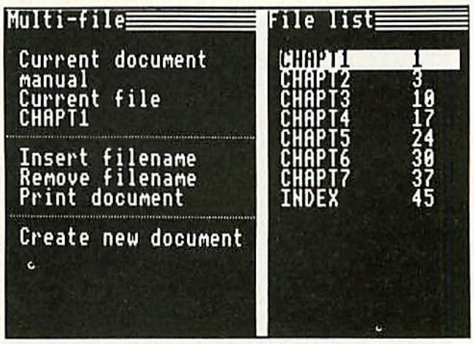
•Multi column
Built in facilities for printing text in up to 5 columns.

• Pull down menu operation
Simple and fast selection of all INTER-WORD options and page layout.

20% discount

Available to all WORDWISE PLUS owners. Simply quote you serial number, name and address when ordering direct. Discount price; **£39.20 + VAT (£45.08 incl.)**

THE NEW WORDPROCESSOR FOR THE BBC MICRO

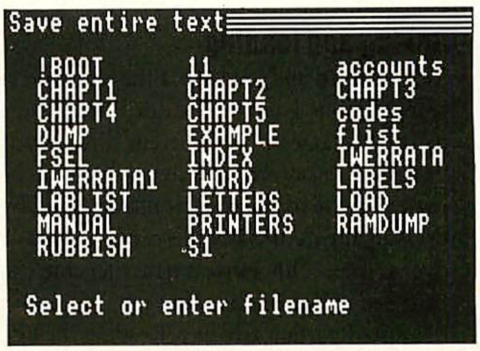


•Multi-file operation
Very large documents can be handled with ease. INTER-WORD's unique multi-file mode puts virtually no limits on document size and allows simple and fast movement to any point in the document.

•Block operations
These are common to most word processors, but with INTER-WORD any part of the text can be marked and then instantly moved, copied, deleted, printed, saved, underlined etc. There is no limit to the amount that can be marked.

•Specific page printing
Any page or range of pages may be printed, even in multi-file mode, with any number of copies.

•File selector
The file selector displays a list of all files - move to one and select it. You will never have to type or remember filenames again.



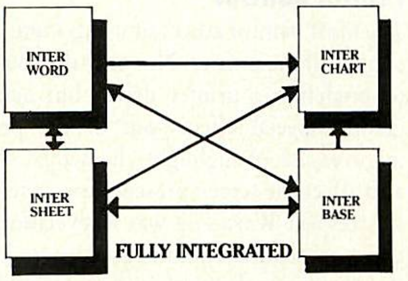
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Computer Concepts

Gaddesden Place, Hemel Hempstead, Herts. HP2 6EX, England. Telephone (0442) 63933

•On screen style changes
Underline, bold and a special 'dotted' style are shown on screen exactly as they would appear on the final printout. Also left, centred and right justified text is shown on screen as you edit. What you see on screen is really what you get on the printout.

•On screen page breaks
You need never lose your place on the page. Top and bottom spaces, with any associated headings, footings or page numbers etc. are shown at all times. Like most features in INTER-WORD, a menu option lets you turn paging off.



•Integrated spelling checker
To be made available soon, this entirely ROM based spelling checker allows text to be checked as it is typed or after typing, at over 9000 words per minute.

•40,53,80 and 106 column screen modes
•Mail merge
•Integrates with all other parts of INTER family
•Automatic page numbering, with headers and footers
•Very fast and smooth scrolling
•Powerful search and replace facilities including wildcards, upper/lower case sensitivity, stored search and replace strings for instant re-use.
•Automatic word count
•Fast simple cursor movement to any point
•Easily tailored to any printer
•Line numbering
•Selectable screen colours
•Compatible with the B, B+ and Master; Solidisk, Aries and Watford shadow RAM boards.

Software is now more important than the hardware, especially with todays falling hardware prices.

INTER-WORD is the most sophisticated and professional word processing package available for the BBC Microcomputer.

MONEY-BACK
Guarantee
Buy INTER-WORD—if you don't like it—send it back for a full refund!
(Available when purchasing direct from Computer Concepts)

right (useful for dates and addresses), centered (for titles, etc) or justified. This action is controlled by menu or function key and all four may be used freely within a document as they affect only the text they are originally applied to.

The Search and Replace facility is menu-driven and easy to use. Select the menu, enter the search string, enter the replace string and away you go. Like *View* but unlike *Wordwise*, the search can be switched on and off. A selective and global search is also possible.

Printer control

The most painful aspect of using *View* is the control of the printer. Not only do you have to predefine a printer driver but actually getting special effects out of the printer involves use of highlight characters, which also affect the screen presentation of text. In this respect *Wordwise* was a revelation: by using embedded commands you could get your printer to do anything it was capable of, simply by embedding the control sequence.

InterWord handles the printer in a delightful way which is a hybrid of the two methods and is worth describing here.

Suppose we wish to italicise some text, first move the cursor to the first character to



The multi-column facility is unique to *InterWord*. Up to five columns per page may be displayed and printed. Here two columns are shown.

be set in italics, and press f1 which presents the embedded command menu. Move to the control code box and simply enter the control sequence. For my Citizen C120D, this means typing:

27,"4"

and pressing Return. To turn italics off, move to the space after the last character, do exactly the same and enter the code to turn italics off:

27,"5"

and that's it. The embedded commands show on the screen as inverted characters – which can fool you into thinking they are markers if you are not careful. Because the embedded commands are stored within the text they can be edited if required: move to the command, press f1 and edit the displayed code. A similar option also exists on the embedded command menu that will allow you to embed a *command. This does not always work as you would wish. For example, if you want to show a list of ROMs within your micro at a point, you embed



The multi-file menu allows numerous files to be daisy-chained into one long document which can then be edited and printed.

*HELP there. But on preview when *HELP is encountered the cursor jumps back to the top of the screen and displays the list over your text.

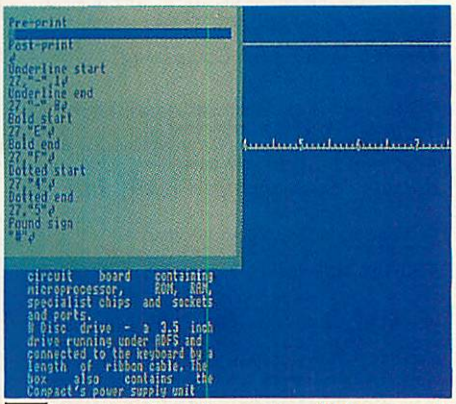
The Printer Control Menu allows you to alter the printer control codes responsible for turning on and off the underline and bold print on your printer. Spaces also eexist for you to define the pound sign and also pre- and post-print control sequences.

It is also possible to specify how many copies of a document you want printed (1 to 255) and also the page range to be printed, so you can have a set of pages printed rather than re-printing the whole document, which is very useful.

Saving and loading

Text is saved and loaded via the main menu using options 1 and 2. The disc is read and a list of filenames in the current directory is presented on screen. The cursor keys can be used to move to a particular filename and by pressing the Return key this can be loaded or overwritten. Otherwise a new filename can be typed in and this used instead. This is not a feature I particularly like. Reading the disc can take several seconds – not long but annoying. During loading and saving *InterWord* breaks a golden rule of computing: it leaves you to watch a blank, black screen. The filename buffer is 47 files long, so when running ADFS a full directory can be read in if required. But it certainly did not like being used with a Solidisk DFS which had opened up a new catalogue to accommodate more than the standard 31 files. Here it simply went into a fit and continued to try to read the disc *ad infinitum*. However I suspect that this is not the fault of *InterWord* and more likely the blame lies with the Solidisk DFS's handling of two catalogues.

Hierarchical directories are catered for by *InterWord*, it is possible to move up and down the directories on an ADFS disc. When used on a network, however, it can only move down through the directory structure and not up. If you wish to move back you must go right back to the root directory and rework your way down. Another oversight here is that on a networked machine each directory can hold up to 255 files – this is longer than *InterWord*'s



The control code menu allows you to configure your own printer to produce special effects. A default Epson set of codes is provided.

file buffer so can confuse it badly.

When a file is saved it takes with it all your preference settings such as on screen colours, column settings, control codes, etc, so that these are all reset when you load a file back in. Of course this means that you only ever need to define a start file once and simply load this in when you start a new document – this is standard file management and is also possible with both *View* and *Wordwise*.

Direct loading of *Wordwise*, *View* (or any other wordprocessor) files is not possible in version 1.00. Text must be in a true spooled form otherwise *InterWord* will lock up. A small 24-line Basic program is supplied in the supplement sheet to strip files of any illegal characters and they can then be loaded into *InterWord*.

Note that spooling a *View* file will not produce a file capable of loading into *InterWord*, but Graham Bell's excellent *View Spooler* presented in our July issue will prepare files if you wish to port them across. Version 1.02 is more robust and will load both *View* and *Wordwise* files.

THE QUINN EASE OF USE BENCHMARK RESULTS

I'm writing this article with *InterWord* as someone who has used the *Wordwise* and *View* wordprocessors, but doesn't have either a manual or a function key strip for *InterWord* – a test described as the 'Quinn Benchmark' some months ago by Computer Concepts. Many years ago I decided to do the news copy for *Acorn User* on *Wordwise* in just this position – and I managed it. *View* failed this test because I didn't think of typing in NEW to get into the text part.

Luckily *InterWord* is automaticallyy in the insert text option when you switch on and the BBC micro's delete and cursor keys work as normal. This means that I can use *InterWord* from scratch without even a function key strip.

InterWord does not work with a second processor switched on – the program tells you to turn the 2P off. I did this and the micro hung up, but pressing the Break key sorted this out.

The program does not respond to the *HELP command, so all I know about it is that it looks like *Wordwise*. To get into it you have to type *IWORD (which took me about five minutes to find out). *InterWord* then came on with 80 columns by default.

The arrow keys move the cursor around the screen, and pressing the Shift key as well shoots you to the end or beginning of a line. Up and down shifts take you to the top or bottom of the text.

As I'm on an Econet machine, I tried to access my directories across the net, and – to my astonishment – it worked! There was a problem in that when I did a catalogue there wasn't enough room in the box to show the total number of files (it displayed a maximum of 51). The normal * system of moving between directories did work however. And it read in *View* files without any problem.

One strange thing is that the menu page is in mode 7 (done I suppose to keep the *Wordwise* feel), but for some reason the Caps Lock is switched on, and switched back off when you return to text. Saving and loading text is easy, and there is checking so you don't delete things by mistake (although I still managed to).

The text screen looks very different to *Wordwise* or *View*, but it seems to do what I expect as I type. When you get to the bottom of a page, the text jumps to the next, which is a bit annoying as you can't see what you've just written.

Now to explore the function keys. Pressing f1 results in a menu dropping down from the top. This tells me how many words I've written and eight other things which seem to make sense. Below this is a list of 'sub-menus'. These turn out to be summaries of the other function keys. Moving around these menus is by arrow and Return keys.

Function key 1 gives me a list of 'preferences', but I couldn't work out how to change most of them. Keys 8 and 9 are obviously to do with markers. Keys 5, 6 and 7 at first seemed not to work properly. It turns out they are used to position text, either pulled over to the right or left of a page or centred. They have other functions to do with printers and control codes when accessed through the menu from f0 or wth a combination of the CTRL key.

The remaining three handle, in order, marked sections, search and replace, and page formats. In the process of playing around I've turned on justification and can't turn it off. Shifting f5, f6 and f7 results in underline and bold on screen. To sort that lot out will need a function key strip.

I've now turned to printing things out and run into problems. First, when I set up a margin down the left of the page, the last few characters wrap arond and this isn't visible on the preview.

Then, when I set up double-line spacing it is printed out assuming the page length has doubled. Also, the double line space isn't shown on the screen.

Anyway, this is meant to be a simple look at *InterWord*. To sum up, I'm impressed. Nearly 1000 words later I still haven't even looked at a function key strip or manual. I haven't talked to Computer Concepts or read what Bruce Smith has written. The compatibility across Econet was unexpected, although CC should clear up the file problem. I've hung up once when printing out and had to press the Break key – and guess what, I ended up back in *InterWord* with my text intact! In short, it's the easiest wordprocessor I've ever used. How good it is at the complicated things I don't know, so I'll hand you back to Bruce for that.

Page layout

The Page Layout Menu allows you to define the format of your page ie, header and footer position and so on. Headers and footers are strangely set from the Embedded Command Menu and up to 60 different ones can be defined at one time! A heading or footer is defined by entering it as a line of text, enclosing it between the two markers, selecting the appropriate heading number on the menu, then selecting either 'Heading/ footing = marked text' from the same menu.

CONTROL KEY ACTIONS

CTRL - A	Delete character at cursor
CTRL - D	Delete word at cursor
CTRL - F	Re-start search & replace
CTRL - G	'Quick' search
CTRL - L	Delete line at cursor
CTRL - N	Move to next page
CTRL - P	Move to previous page
CTRL - Q	Next 'quick' search
CTRL - R	Remove markers
CTRL - S	Swap case
CTRL - X	Mark all text
CTRL - Z	Mark word at cursor

An excellent facility which alone makes *InterWord* worth the price is its multi-column output. By setting the ruler to a suitable width and adjusting the column count in the Printer Set Up Menu up to five columns of text may be printed and pre-viewed on screen. The final screenshot shows a typical output. Successive pages are printed in columns – if the column width was set to two (as in the photograph) then page one would be printed as the left-hand column and page two as the right-hand column. On sheet two pages three and four would be used to print the two columns, and so on.

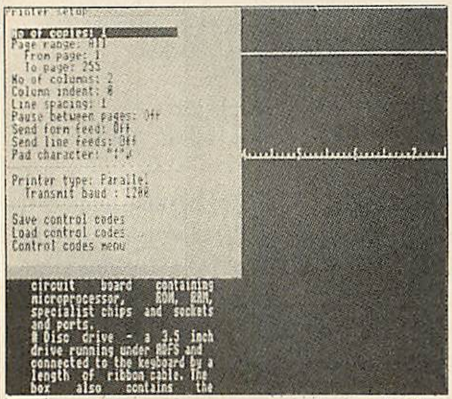
If multi-column output is one of *InterWord*'s best features, its line spacing facility is one of its worst. The formula used by most professional writers is double line spacing, occasionally mixed with single spacing for small tables and triple line spacing when the printer character pitch and line spacing have been altered to produce wide tables in one go. In *View* and *Wordwise* the embedded/ edit command LS allows the line spacing to be changed at any point within the text. But in *InterWord* this is not possible – line spacing can only be set once and not changed during printing. Both *Wordwise* and *View* also compensate for this line spacing so if a blank line is printed the page length counter is inplemented. Thus using double line spacing on a 66-line length sheet, 33 text lines

and 33 blank lines are printed. In *InterWord* this does not happen; the blank lines are not seen and so the same number of lines are sent to the printer as a 'page'. Thus with double line spacing and a page length of 66 lines, 132 lines (66 printed, 66 blank) will be sent to the printer. So if line spacing is changed you also need to take into account the page length and adjust this, and also the position of the headers and footers.

Of course if you never use multi-line spacing this has little worry for you, but for those of us who do. . . .

Multi-file

For very long documents, or even short documents where memory might be tight on a micro without shadow memory, the



The Printer setup menu shows further how easy printer control is from within *InterWord*. The control codes may be saved and loaded as a separate file.

multi-file document facility comes into play. Using a pull-down menu you can set up a mini-file which will use either your own specified filenames or automatically chosen ones which all form one large document. You can load in the first file and then move on to the next file or back to a previous one by using the Shift up/down arrow keys. The current file is resaved and then the new one loaded in.

By editing the file list the order of the files in the document can be changed, and files deleted and added as required. Documents can be printed out in their entirity or from a particular file.

Once mastered, the multi-file facility is very simple to use and certainly much better than the EDIT facility in *View*. However the manual's description of setting up the multi-file facility is appalling, especially if you have several files that you wish to merge into one long document.

ROM link

One of the most versatile features of the *Inter* range of firmware is the ROM link facility – and here *InterWord* is no different from *InterChart* and *InterSheet*. It is possible to have up to 16 packages (eg 16 *InterWords*, or five *InterWords*, three *InterSheets* and two *InterCharts*, etc) but with only one ROM of each present. In the case of *InterWord* this is done by specifying a number (0 to 15) when *InterWord* is selected, ie IW.4 would select *InterWord* package four. Text can be entered and then another *InterWord* package can be entered, and text entered in this package. The text is preserved in all the other packages, and they can be freely moved to and fro with no loss of text. A series of 'colon' (:) commands exists which are entered like * commands from menu mode and which allow you to get text in a variety of ways from other *InterWord* packages. Data can also be transferred from any other *Inter* ROMs present eg a row of figures from *InterSheet*. The information box above lists the commands available and their action.

INTERWORD ':' COMMANDS

: IW.*n*: GETTEXT - import all text from package '*n*'.
: IW.*n*: GETMARKED - import the marked section of text from package '*n*'.
: IW.*n*: GETTO *"string"* - import all text up to the specified string, from package '*n*'.
: IW.*n*: MOVETOP - reset the ROM-LINK pointer to the top of package '*n*'.
: IW.*n*: MOVEAFTER *"string"* - move the ROM-LINK cursor to the character after the specified string in package '*n*'.
: IW.*n*: MOVEFORWARD (*number*) - move the ROM-LINK pointer forward the specified number of characters in package '*n*'.
: IW.*n*: GETCHAR (*number*) - import the specified number of characters from package '*n*'.
: CANCEL - completely delete the current package. The user must then issue a star command to re-enter a new package.
: KILL - delete ALL ROM-LINK packages currently in memory. The user must then issue a star command to re-enter a new package.

Conclusions

In *InterWord* Computer Concepts have produced a ROM that takes the BBC micro almost to its limits. It belies the fact it is working on a 'home' micro and is comparable to many of the wordprocessors to be found on 'bigger' machines.

To use *InterWord* effectively a shadow RAM board is really needed. And 6502 second processor owners will not be able to use *InterWord* across the Tube because of its 32k size. The excellent multi-column facility here is first rate and if you are producing newsletters, new sheets or circulars then *InterWord* is worth every penny of the price for this feature alone.

The handling of embedded printer control codes is excellent and could not be bettered in any way. Similarly the multi-file and ROM link capabilities are much admired.

The deficiency in the line spacing is to my mind a major blunder. A professional package should aim to attract professional people and this disability will lose Computer Concepts sales. Simply, it must be corrected in any future issues of *InterWord*. Space in the ROM is tight but space must be made – the ability to define 60 headers and footers is rather ludicrous and some of the minor items provided in the menus could be lost to make extra room.

InterWord is fast to use and text scrolling is excellent. But the time taken to load and save files is rather tedious and an option could be included to get rid of this menu file load facility. Similarly the deletion of a few lines of text 'by hand' using the delete key has to be done slowly to avoid over-deletion as the screen is not adequately refreshed to show you what has actually been deleted.

How does *InterWord* compare to *Wordwise Plus* and *View*? There is no real comparison with *Wordwise Plus* – *InterWord* is streets ahead. But *Wordwise Plus* still has a role to play. Even though I have been using *View* for a year or so now, I still use Wordwise Plus because its programming language allows text to be manipulated in ways not possible in *View* or *InterWord*. Yes, I would upgrade from *Wordwise Plus* to *InterWord*, but I'd be tempted to keep *Wordwise Plus*. In general use, *InterWord* is better than *View* – but I probably wouldn't part with my cash if I'd already bought *View*, unless I wanted the multi-column and the multi-file capability.

I now find myself using *InterWord* for letters and newsheets all the time – it is much nicer to use.

This review was prepared on *InterWord* and I have enjoyed doing it. But it will now be spooled into *View* and paginated for printing. It is only this shortcoming that stops me from telling everyone to drop everything and go and buy it.

Interworld £49 + VAT
Computer Concepts. Tel: (0442) 63933

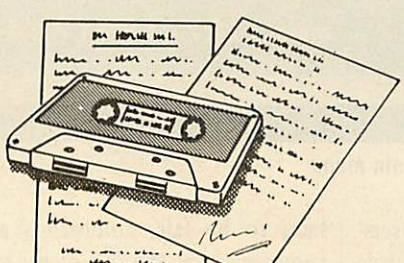
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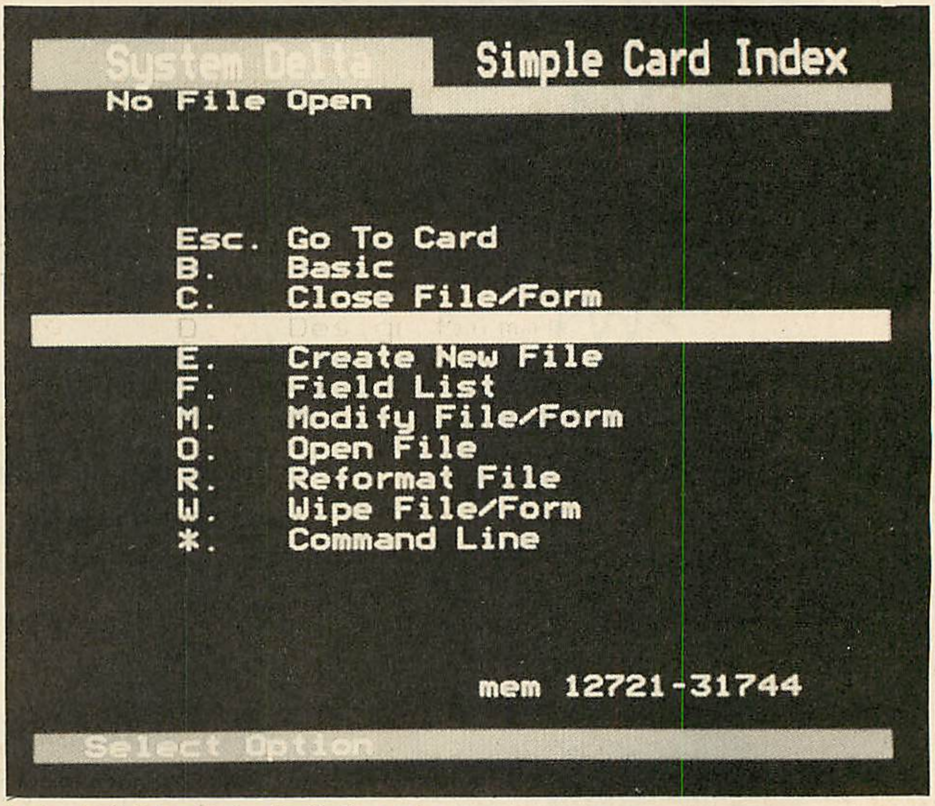
If you need a programmable database management system Minerva's System Delta is the one for you

John King

It is products like *System Delta* from Minerva Systems which restore my otherwise rather intermittent faith in the micro software industry. Here is a general purpose tool for advanced business software designers which comes complete with a fully working and essentially self-documenting example application. You are unlikely to find any software for the BBC micro which more comprehensively covers this style of database management.

The most vital component of the package is a 16k (EP)ROM containing the *System Delta* kernel, a set of machine code routines designed to simplify the creation, indexing and display of records in database files. Currently, the ROM is supplied only in a package with a finished application, the *System Delta Card Index Application*, which is a disc of hybrid Basic/kernel programs offering a fairly user-friendly card oriented database management system (DBMS).

By card oriented, Minerva means that the information in the database is entered and displayed in the form of a number of fields positioned in specific places on a mode 7 screen. It is the application itself which limits the user to the use of mode 7; the ROM kernel provides some pre-defined commands for displaying cards, but if you write your own applications then you are not constrained to use them. Minerva publishes a ½-in thick Reference Guide (its sectioned page numbering technique makes it difficult to count the pages) which painstakingly details the behaviour and control of the ROM, its interface with Basic, memory usage and command syntax. This book is available separately at a cost of just under £20.



System Delta's Card Index Application main menu

Card index application

Minerva's own application offering for *System Delta* is a very good general-purpose DBMS in itself. It allows you to define the layout of cards up to 200 by 200 characters in size, comprising as many as 255 fields of up to 200 characters each. Just over 8000 of these cards may then be entered, indexed and retrieved using the software. The cards are scrolled underneath a mode 7-sized window, enabling very large cards to be called up in a matter of seconds, and up to eight 'subsets' can be defined which re-order the cards according to single or multiple criteria. Cards can be sorted alphabetically, numerically and chronologically in either ascending or descending order, and it is possible to include mathematical expressions in subset definitions which are then recalculated each time a card is updated or displayed.

By providing menus for selecting operations within the software the user is relieved of having to learn long command sequences (as one must with *ViewStore*). Each menu entry can be selected by either typing its initial letter or by moving a cursor with the arrow keys, and potentially dangerous options insist on separate confirmation from the user before they take place.

Two similar editors are provided, one to design the layout of cards and the other to allow cards to be viewed and updated (known as 'browsing'). These are both quite sophisticated, and as such suffer a little from the 'every key has two functions' syndrome. In fact, to be fair, commands are carefully summarised at the top of the screen, and I suppose I should not complain at the plethora of facilities on offer.

All of the *Card Index* software is written in Basic liberally sprinkled with *FX and * commands. This makes it really quite simple to decipher, and you can learn a good deal about using the ROM kernel just by reading the source code. However, the comprehensive Reference Guide is vital if you really want to get to grips with the underlying details of its implementation.

Considered on its own, the *Card Index* is a very nice piece of software, and I wouldn't need much persuasion to use it myself for real-time applications such as customer enquiries or mailing lists. It has the major advantage over most other DBMSs that you can actually take apart the code and alter it to suit your requirements – this should not be underestimated, since it is usually the niggly details and not the basic structure of this kind of product which irritate.

The ROM kernel

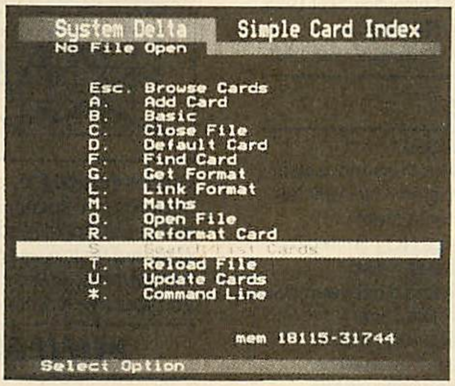
In my view the most exciting aspect of *System Delta* is its superb interface to Basic. For example, many of the kernel commands initiated by issuing * commands can take Basic variables as their parameters – no messing around with CALL parameter lists is needed. This makes the code so much more readable that it is quite a breath of fresh air; for instance to open a database file the command *SDopen Name$ is issued, with *System Delta* locating and checking the string, opening the file on the filing system and returning a file handle into its system variable space.

Equally impressive is the automatic mapping of these system variables on to Basic ones. You can instruct the kernel to map any of the 20-odd internal variables (which include file handle, card size, sort field number, workspace free, current record number and so on) on to any named Basic integer variable. The *SDvar command does this – for example, to have the disc location of a record (system variable 14) appear automatically in discloc% you just say *SDvar 14,discloc% and the kernel updates discloc% for you as often as necessary. You can probably imagine how much brain strain this facility will save you if you are writing large DBMSs, and it would be nice to see other producers adopt this technique.

Of course this interface has limitations; it cannot take expressions as parameters, you must evaluate them into a variable first. This is not a serious failing, and in fact the virtues of evaluating everything before calling the function probably far outweigh the desirability of full expression handling.

Kernel operations

The commands which the *System Delta* kernel supports are divided into three groups by their syntax. The first group is a range of named commands (all names start with SD) which provide the more complex facilities and accept Basic arguments. Examples of this kind of command include *SDvar, *SDsubset and about 35 others. The second group consists of *SD followed immediately by a two-digit decimal number, eg *SD06 (which prompts the user to press any key) and *SD23



Options are selected using menus

(which locates a disc record by key number). The last group are accessed under the wing of an officially issued *FX number (*FX 163,16,yy) and provide the lowest level of operations – basic expression evaluation, space stripping from string, error raising etc.

The Reference Guide spends a little over 80 pages going into the use of all these commands, devoting a page to most of them, under the headings: Function, Syntax, Operating notes, an example, Associated keywords and Technical points. It seems a little fruitless for me to try and repeat any of this information, but let me tempt you instead with a simple example; all you should need to understand the following is a little intelligence and the fact that &A00 is a common buffer used by many *System Delta* commands (see figure 1). In case you didn't work it out for yourself, that snippet created a database file with three records in it!

The kernel can be enlarged with the help of disc-based extensions. Two of these are supplied with the system, offering the file creation and compaction commands which are rarely enough used not to need to be in ROM. Presumably, it is possible to devise extensions of your own using this facility, making the *System Delta* environment customised to your own applications. There is no information on this in the manual, but I'm sure it could be extracted from Minerva.

Editing features

System Delta contains a couple of simple editors which save a lot of bother in getting data from the user. The first is a line-oriented editor for prompting and returning commands; it simply gets a line from the user, allowing deletions etc. and returns it in &A00. The *Card Index* uses this to get MOS commands and menu requests.

The second editor is a good deal more fancy. It is initiated by *SDedfield or *SDedrec, whose names are fairly self-explanatory. In addition to the line-oriented features of the first editor, this allows the use of up- and down-arrow keys to move from field to field. It may thus be used to amend a whole card full of information, returning automatically when the last field is filled.

Records and formatting

Once created, records may be located by number or by any of several keys. When the record has been found, fields can be extracted into the string workspace at &A00 for manipulation or display. In fact, the whole card can be displayed on the screen underneath an editor (ie you can modify it) with just a couple of commands: *SDscroll displays the card on a mode 7 screen and allows the user to slide it around underneath the window that the screen forms, so as to reveal hidden fields, while *SDpaint displays the current record data on the card, accepts user keypresses and places them on the card. There is also a range of individual commands for getting data from fields in a form that one could use to construct an editor for other screen modes.

Just to step back a stage, records may be found using either an ordered numerical search (in either direction) or by means of *SDfind and *SDdup. The former locates the first card containing the search string which is its parameter, the latter finds any duplicate cards which satisfy the search. I can scarcely imagine a simpler search facility!

Documentation

The program in figure 1 is, in fact, one of the examples from the manual. I was very impressed both by their lucidity and attention to detail. The *Card Index Application* has a 70-page manual which not only covers the application itself in detail, but also contains enough information for interested readers to

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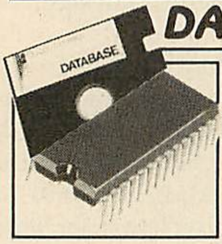
John Dawson, Your Computer, Feb 1985.

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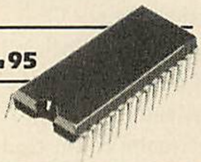
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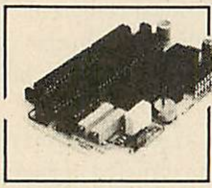
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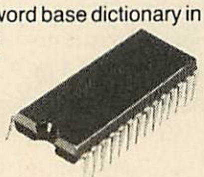
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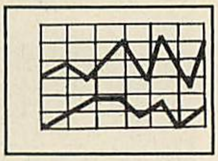
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```
 10 CLOSE #0:MODE 7:*SDreset
 20 *SDopen DEMO
 30 FOR card% = 1 TO 3 : *SDadd
 40 READ name$,tel$
 50 $&A00=name$ : *SDpfield name
 60 $&A00=tel$  : *SDpfield tel
 70 NEXT
 80 *SDclose ?
 90 END
100 :
110 DATA B.J. Stearn, (0392)-37756
120 DATA Chris. Ward, 836-2441
130 DATA Mad Alex, (Dungeon)-6969
```

Figure 1. Creating a database file containing three records

try and delve into the software. It is accompanied by a large wallchart which shows the hierarchy of menus in the *Card Index* software – a handy reference for impatient users such as I!

The Reference Guide is really essential for those who do not wish to get their disassemblers out and reverse-engineer the code. It goes into commendable detail, telling you what memory is trampled on, how the data is stored on disc, how the indexing is done so quickly (key hashing, for those who know about searching) and so on.

The presentation of both manuals is, in my opinion, of a high standard. It really is rather a matter of taste, for while it is NLQ printed on a dot-matrix printer the use of type sizes and styles is the best I have seen in any software manual for a good long time; a particularly nice touch is the button-shaped keyboard keys (eg TAB) which stand out from the text much better than the traditional use of angle-brackets etc.

Conclusion

If every database system came with full technical information and source code, I wouldn't be making quite as much noise about this one. But they don't, and even if they did *System Delta* would stand a good chance of coming out on top.

I am tremendously impressed, not least by the amount of effort which Messrs Stearn and Fisher of Minerva must have put into the product. Admittedly, there is a fundamental limitation of the supplied software insofar as it is directed at mode 7 screens, which you either love or hate (and I hate fervently). However, this no doubt has something to do with historical memory limitations, and it may be hoped that it will be overcome in the future. In the meantime, if you need a programmable DBMS and/or a card index style database, go out and buy it you'll be hard pressed to find a more useful and educational product for the job.

System Delta £64.95
Minerva Systems. Tel: (0392) 37756

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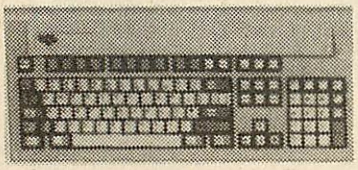
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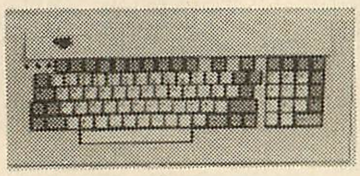


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PUTTING PRINTERS TO THE TEST

In the first of a new series, we put three printers through their paces

Martin Phillips

There are a good many dot-matrix printers on the market, each claiming a whole host of commands, print speeds and other facilities. Comparisons between them are useful when deciding which one to buy. Generally such evaluations do not highlight the major problem with compatibility and standardisation of commands.

In order to do anything more than a subjective comparison between printers it is necessary to have a set of tests which can then be compared as speed trials, for compatibility and for versatility of print functions. To this end I have produced three benchmarks to provide speed tests, plus a check on the compatibility of the particular printer and the quality of print.

The benchmarks have been chosen for several reasons. First, they provide a wide range of tests for the printer, both for speed trials and for print styles. Second, they are comparatively short programs, making it easy to enter and use. Third, they include the commonest routines readers are likely to want their printers to perform, and fourth, the benchmarks take quite some time to print, thereby minimising errors in timing.

Most printers now have input buffers which mean they continue printing after the computer thinks they have finished, hence the computer cannot be used to time them. Benchmark 1 is a screen dump routine. This tests compatibility of bit-image routines as well as providing a time trial. A bleep from the computer signals that the printer has started to dump the screen image (a series of concentric circles), and the signal for the end of the test is when the printer form feeds the sheet.

This is necessary because many printers do not now have a bleeper in them. Benchmark 2 is a routine to print 128 different print styles. Again the same signals are used to start and stop the printer, and the printer has a six-line skip-over perforation set from software. This is therefore an extra function that is tested. Benchmark 3 repeats part of this routine but in the NLQ (near letter quality) mode. Only the pica print style is used because many NLQ printers do not allow elite NLQ. This

10 Steps to follow when buying a printer

By popular demand we reprint *Acorn User's* 10 point plan for buying printers from December, 1985.

1 Centronics
The BBC micro and Electron have a Centronics printer interface. A printer must have one to enable you to use the printer port; if it does not then don't even contemplate purchasing it.

Some printers can be used in conjunction with the RS423 port. The only indication of this is when you wish to locate the printer some distance from your micro, eg in the next room. As there is no RS423 port on the Electron this option is not available.

2 Traction
Standard continuous listing paper is traction fed using holes in the side of the paper. Installing paper in the fashion is difficult on some printers so try it out. Check that paper is not re-fed through the printer feed.

Friction feed is a must if you wish to print on your own stationery, so take it along and see how the printer copes.

3 Ease of use
Consider the points above, and ask yourself: how easy are the buttons to use?

Printers, like typewriters, require a ribbon, so you should find out if they are readily available, how easy they are to replace (try doing it yourself) and how much they cost. If you plan to use a wordprocessor, can the printer driver generator work the printer?

Do you need to use a wide paper (eg, to print spreadsheets) or print labels? If so, ensure that the printer can cope.

4 DIP switches
Get the dealer to show you how to use these to configure your printer for its mode of operation. Get the dealer to explain how they work and set them.

5 Print styles
Don't even contemplate buying a dot-matrix printer that cannot produce near letter quality (NLQ) print. If you need to use italics, check the quality of those produced by the printer. This can vary a great deal, but because of the printing technique used by dot-matrix printers, it will never be very good.

Daisywheel printers can produce most typefaces but you'll normally have to change the daisywheels over at the appropriate point – get the dealer to show you how. This can become a time consuming operation, and it's expensive as you'll need to buy them.

Many printers also allow you to define your own character set.

6 Printing effects
How easy is it for the printer to perform printing effects such as emphasised print and underlined print? If you are using it for statistical or scientific applications then can it print superscript and subscript characters?

7 Graphics
Dot-matrix printers can reproduce a copy of your screen using a graphics dump program, but this is not possible with daisywheel printers. Most printers come with a dumping program – check that this is the case. If not, take a program of your own and a disc or tape containing a suitable saved screen that you can dump and compare to other printers. If a screen dump program is supplied with the printer is it capable of producing a truly round circle?

8 Noise
All printers make a noise, but some are louder than others. If you envisage long print runs and frequent use of a telephone, noise is a major consideration. A lid will often dampen the sound, as will a rubber printer mat.

9 Speed
Slow printers are infuriating. Check the quoted speed of the printer which is given in characters per second (cps). In practice the actual speed is 60 per cent of that quoted. The actual speed will be half this again with NLQ, emphasised or double strike printing.

A printer buffer is a must. You need not buy this as an extra, as most printers have one fitted – ensure this is so.

10 Manual
Nine times out of ten you can judge the printer by its manual. Read the first few pages in the shop – if the introduction doesn't make sense you are unlikely to follow the more technical details.

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40 80 3" 0

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SPECIFICATION

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2) File Size	- max 65,000 records
3) Record Size	- up to 2048 characters and 200 fields
4) Field Size	- up to 254 characters
5) Holds	- approx 1200 ADDRESS records per 100k
6) Search	- 5 search fields using powerful options
7) Sort	- 500 records on 3 fields in 60 seconds.

SYSTEM FEATURES

*CALCULATE - using any valid expression
*PRINTOUT - Powerful options
*REDEFINE - Titles, fields etc.
*TRANSFER - From one file to another
*GLOBAL ENTRY - of repetitive data
*SEARCH LISTS - Allow creation of sub Databases within main Database
*SPOOLER - enables you to create spooled files that are compatible with Wordwise, View etc.
*INPUT - is a routine included on the disc which will allow you to write your own utilities for accessing your data. Many of the programs on the utilities disc were written using this procedure

BETA-BASE UTILITIES £12.00

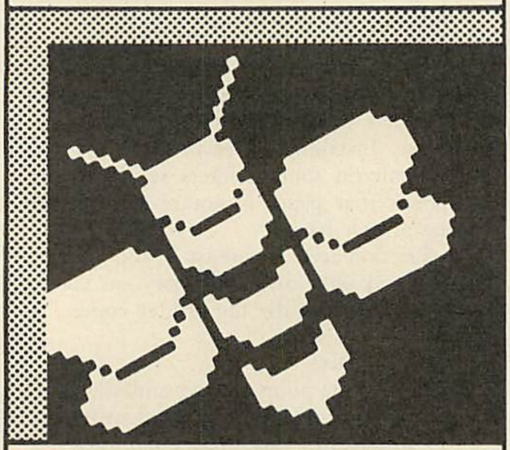
40 80 3" 0

Extend the power of Beta-Base with the extra facilities provided on this disc.

*MAIL MERGE
*LABEL PRINTER
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*EXTENDED SEARCH
*FREE FORMAT TRANSFER
*FAST PACK
*STATUS

The MAIL MERGE alone is worth £12 so you get a real bargain with this disc. The features are so numerous that we cannot mention them all here.

Ask for our UTILITIES DATA SHEET if you want more information.



MACROM £40 £35 DISC

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MACROM is a fast full featured MACRO ASSEMBLER ROM that allows the use of macros, which are loaded from a macro library stored on disc. Assembly can be from disc to memory, disc to disc, memory to memory or memory to disc, thus allowing the use of very long source code up to the length of your disc. MACROM source code is tokenized and thus takes up far less room in memory or on disc than most assemblers.

- Operate in any mode
- Tokenized source code
- Assembles 6502 & 65C02 codes
- Automatically loads macros from library on disc
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- Macro library supplied plus demo files
- Chain program sections into main code
- Many different assembly options
- Converts BBC assembler code into MACROM source code
- Very fast & very flexible

In a comparison with ADE, MACROM was able to assemble a program to disc in 1 min 24 secs compared to 5 minutes with ADE and the source code took up 30% less room on the disc.
Ask for a data sheet today

RAMROD £40 ROM £35 DISC

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RAMROD is the ultimate in toolkit ROMs and is fully compatible with the whole BBC range from Model B through to the MASTER 128 and including both 6502 and TURBO co-processors. RAMROD adds 54 new commands to your computer. Areas covered are DISC (DFS & ADFS), GENERAL (memory commands etc.), ROM (including sideways RAM) and TUBE.

RAMROD provides commands to dump memory or a disassembly of memory to a printer. Editors can display the screen in 40 or 80 column mode.

DISC
Edit discs and search for ASCII or HEX sequences.

GENERAL
Edit, search, disassemble, compare, dump to printer and relocate ANY area of memory including the SHADOW screen. List vectors in use, load and save function keys even on MASTER etc.

In addition to the above you can move between ROM/RAM banks using (CTRL) Cursor Keys when in either memory or disassembly mode PLUS you can switch between memory editor and disassembler by pressing (CTRL)(TAB).

ROM
Includes commands for listing, loading, saving, wiping, swapping, ROM images. PLUS formatting and titling RAM banks for the ROM filing system and saving programs in RFS format.

TUBE
Provides the same memory commands as GENERAL plus SHIFT and COMPARE memory across the TUBE both ways.

We cannot do justice to RAMROD in the space here so please ask us to send you a fuller data sheet - RING NOW!

NEW PRODUCTS
Watch out for a fabulous new product which will be released during SEPTEMBER for the MASTER and its compatibles.

This is a high quality art package called ARTROOM but it offers many features not provided elsewhere. It is a full screen package and is written by the authors of FLEET STREET EDITOR so you know that it will be good.

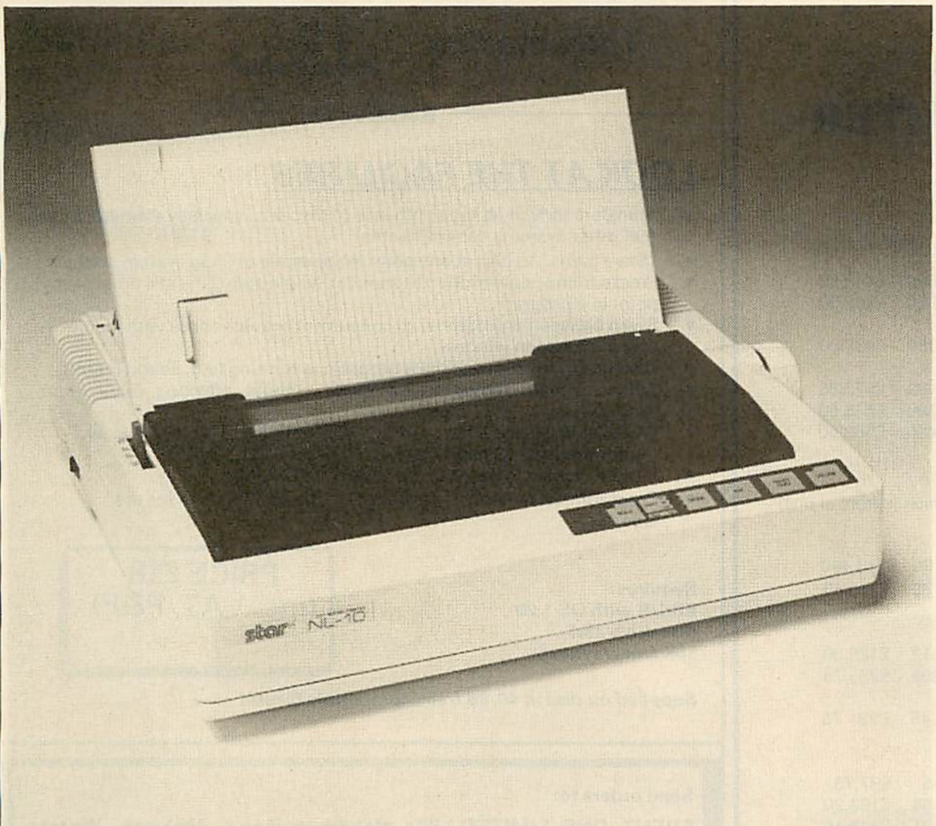
Ask for a data sheet NOW!

40 80 3" 0 ________ DISC
40 ________ 40 TRACK
80 ________ 80 TRACK
3 ________ 3" DISC - ADD £3
________ EPROM

Send for detailed newsletter.
All prices inclusive of VAT & Carriage - NO EXTRAS! Please state 40 or 80 track disc and state D.F.S. you use.

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The Star NL-10: sturdy-looking and well-made

benchmark not only provides a time trial but also checks that all the print styles work in the NLQ mode. NLQ mode is software selected to check standardisation of commands. Details of the Benchmark tests on the Yellow Pages.

Printer Articles

Listed below are details of issues which contain printer reviews. In addition don't forget to look at the December 1985 issue which contained a 'Printer Special', weighing up the pros and cons of what makes a good printer.

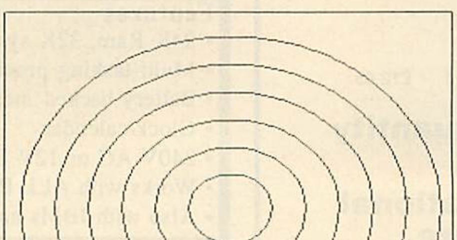
Amber – October 1982
Olivetti JP101 – May 1983
Seikosha AP100 – July 1983
Epson FX80 – October 1983
Juki 6100 – January 1984
MCP40 – February 1984
Star DP8480 – April 1984
Star Gemini 10X – April 1984
Star Delta 10X – April 1984
Canon PW1080A – June 1984
Sanple Daisy Step 2000 – June 1984
Brother EP44 – July 1984
Canon PJ1080A – July 1984
Seikosha GP700A – February 1985
Epson JX80 – October 1985
Integrex Colour Jet 132 – August 1986

To help you compare printers we are starting a 'printer fact file' series, showing how different machines perform the same benchmark tests and with comments on them. Here are the first three.

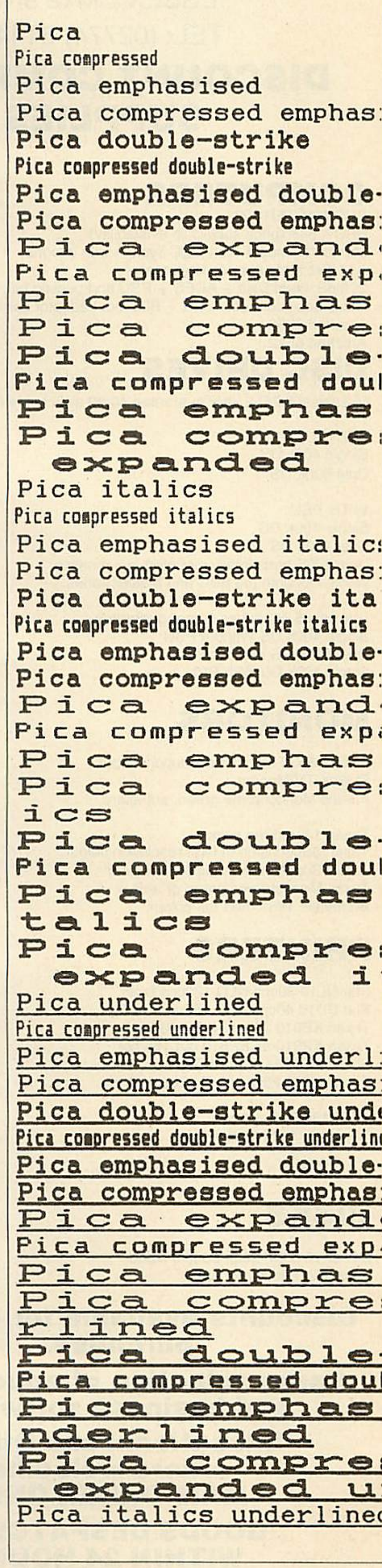
Star NL-10

Target price: £229
Benchmark 1: 58.3sec
Benchmark 2: 4min 28sec
Benchmark 3: 5min 30sec (partial failure)
Features: The printer uses a plug-in cartridge for the particular interface

The Star NL-10 is a very sturdy-looking, well-made printer. There is a series of buttons on the front to provide several



Printing circles on the Star NL-10


Pica
Pica compressed
Pica emphasised
Pica compressed emphas:
Pica double-strike
Pica compressed double-strike
Pica emphasised double-
Pica compressed emphas:
Pica expand
Pica compressed exp
Pica emphas
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Pica double-
Pica compressed doul
Pica emphas
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Pica italics
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Pica emphasised italic:
Pica compressed emphas:
Pica double-strike ita
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Pica compre:
expanded u
Pica italics underline

NLQ print on the Star

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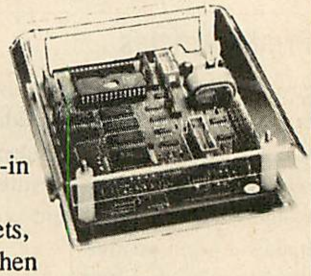
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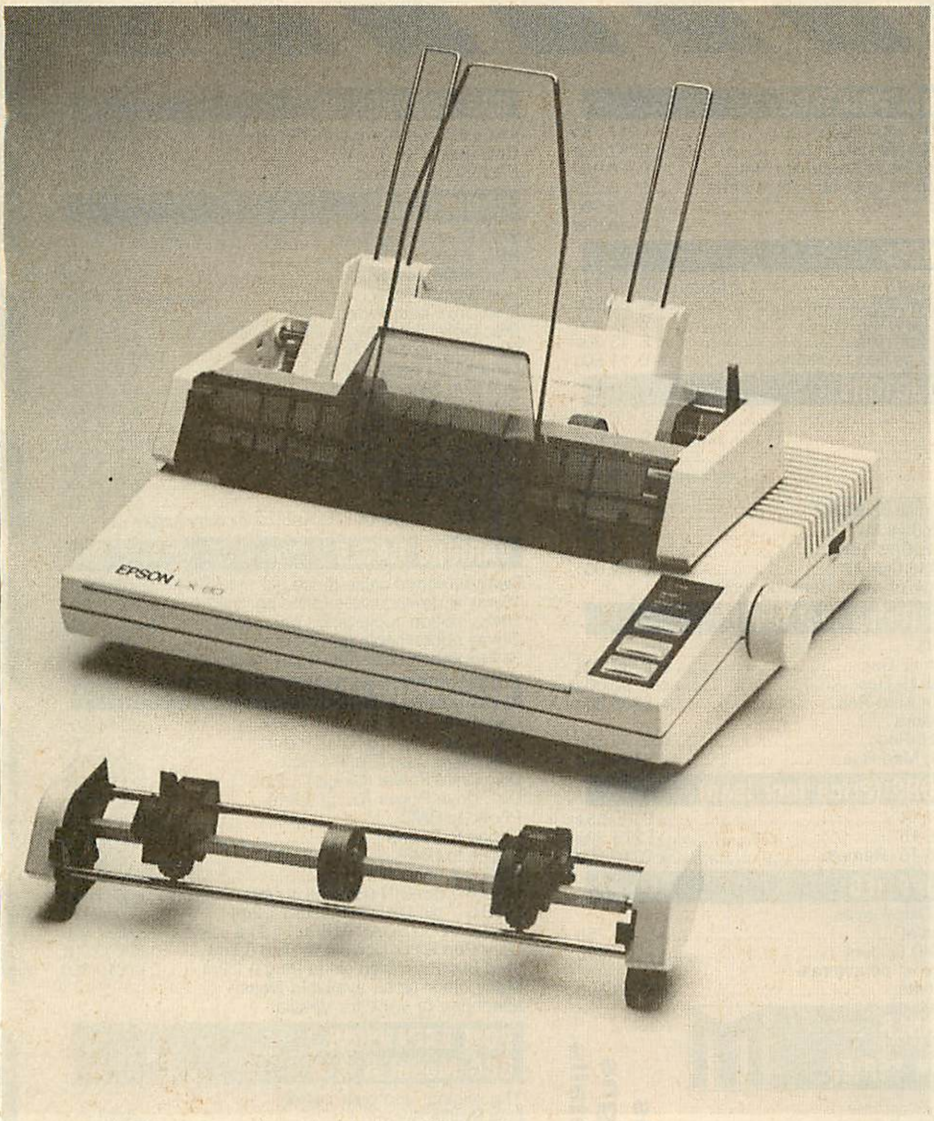
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The Epson LX80: sleek-looking, but it doesn't have the speed of the Citizen and the Star

printer controls. I particularly liked the small light to indicate when NLQ had been selected. Paper feeding was easy, either as single sheets or as fan-fold paper. A good point was the tear off bar which is as close to the print head as possible, so that you can use that as the top of sheet marker. The DIP switches are accessible from the rear.

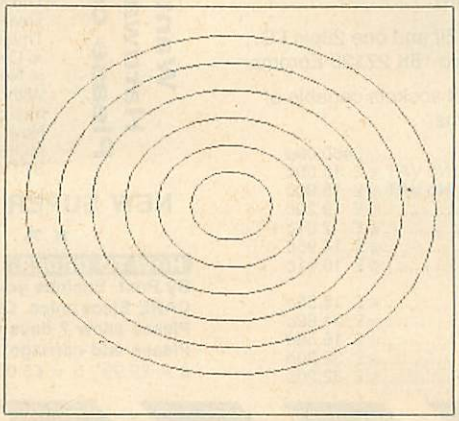
The print style is clear and the NLQ is of good quality, although only some print styles are available. It will not do NLQ italics, compressed or emphasised print.

The handbook is well-produced and easy to follow, but there are no examples given in BBC Basic.

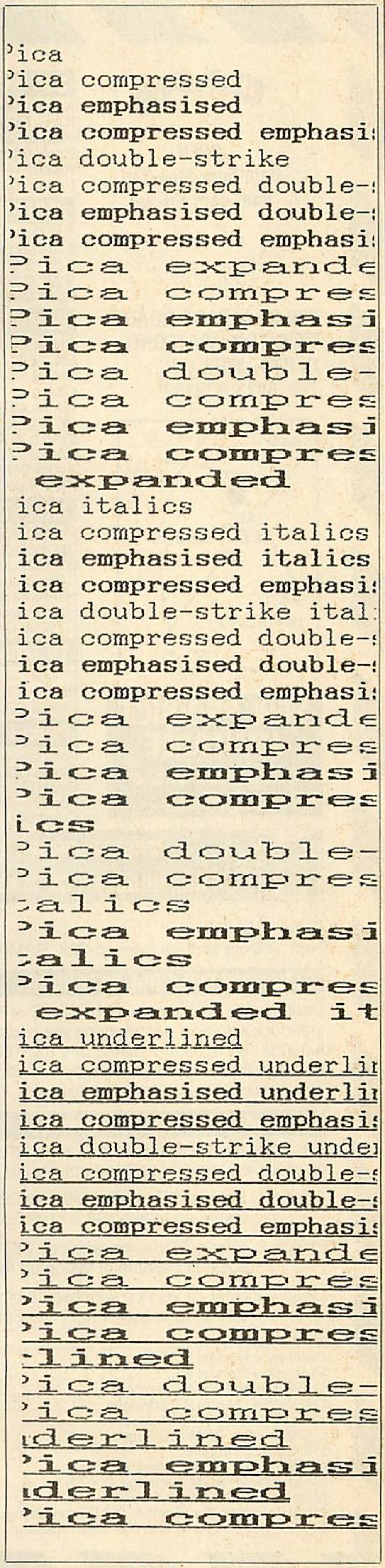
Epson LX80

Target price: £229 (Tractor feed £23 extra)
Benchmark 1: 1min 09sec
Benchmark 2: 5min 24sec
Benchmark 3: 4min 40sec (partial failure of test)

The Epson LX80 is a sleek-looking printer. However, it does not live up to the Epson standard of quality and performance. The benchmarks are a little slow compared to the Citizen and the Star. The NLQ mode would appear faster, but it only supports emphasised, expanded and underlined print. The rest are printed as ordinary NLQ, and this should be quicker than the



Epson LX80 circle quality



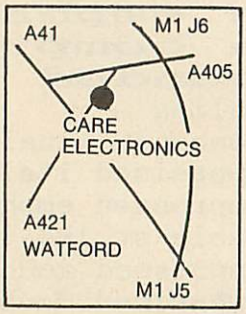
Epson's NLQ print style

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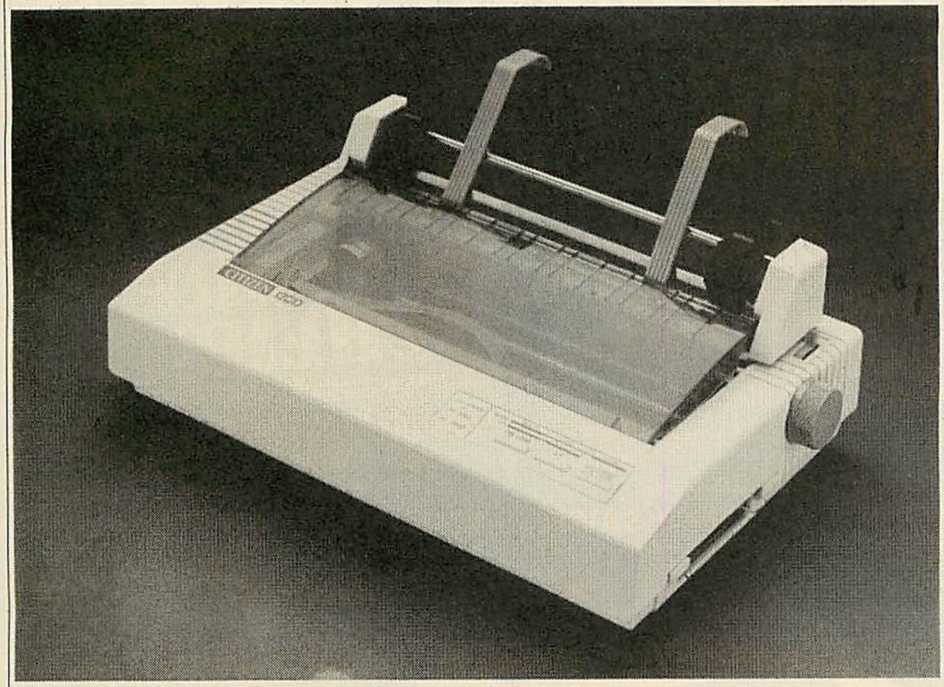
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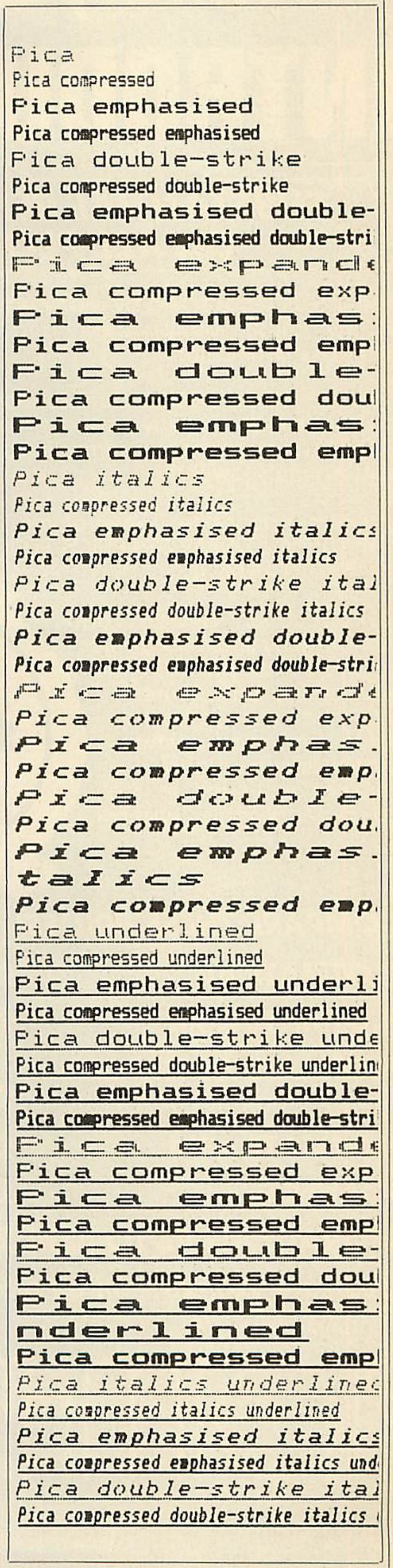
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BARCLAYCARD VISA
Access



The versatile Citizen 120D has over 3000 print style variations


Pica
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Pica compressed emphasised
Pica double-strike
Pica compressed double-strike
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NLQ from the Citizen

Citizen, which will complete the benchmark, and therefore has to make more passes to print some of the effects such as double-strike.

The NLQ print has a ragged appearance, and is well below the standard of the Star or Citizen. The tractor feed does not have a tear off bar for the paper. The DIP switches are accessible from the rear.

The handbook is generally very easy to follow. A great improvement on earlier Epson manuals. However, examples are not in BBC Basic.

Citizen 120D

Target price: £159 inc VAT
Benchmark 1: 56sec
Benchmark 2: 4min 02sec
Benchmark 3: 5min 20sec
Features: Single sheet tray and tractor feed as standard. Two-year guarantee.

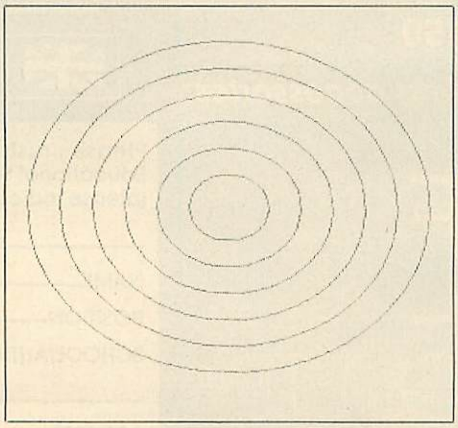
This is a tremendously versatile printer with over 3000 print style variations! The printer is fully Epson-standard compatible with some useful new commands, including double-height print, which can be used in conjunction with any other command and reverse print (white on black) which only works with some print styles.

An unusual feature is that almost all of the print features can be compounded. Hence it is possible to have such things as double-height elite emphasised print in the near letter quality mode.

The DIP switches are easily accessible without recourse to a screwdriver, but are hidden from view as they are fitted into the interface cartridge. There are two such cartridges available, one for parallel and one for serial. The normal one for the BBC micro is the parallel.

The print styles are generally very good, although the lower case 'p' is a little odd. The printer suffers from the lack of a tear bar and as the tractor feed is above the print head, it can be wasteful on paper. I found that with the tractor feed fitted, it was annoying that the cover could not be lifted with the tractor feed paper clamps open. Small points which spoil an otherwise delightful printer.

The handbook is generally well written and very comprehensive, although it makes no reference to the BBC micro. A commands, summary sheet is included.



Circle printing with the Citizen

Announcing a Great New Deal for all Primary and Secondary Schools

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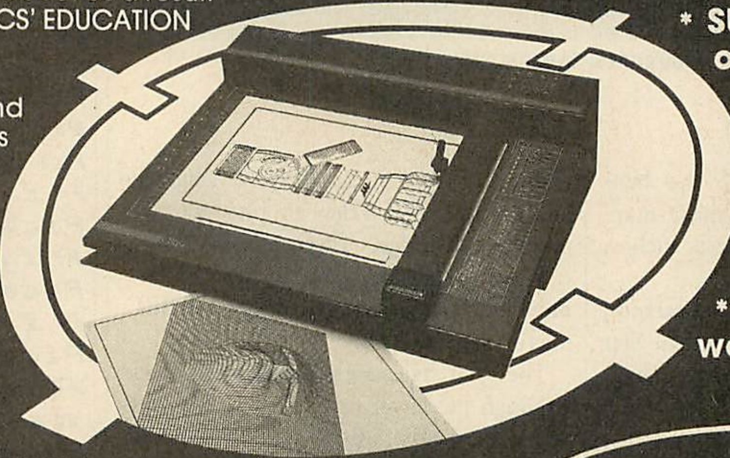
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UPGRADE KIT A3 TO A3M	**£150**	

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NEWS

Nuclear software

AVP Computing is extending its range of educational software with a selection of new titles. The company has developed a reputation for simple and clear CAL (computer assisted learning) packages. As a bulk purchase agency, it also offers a wide range of software from many notable publishers.

Its *Nuclear Reactor* package allows the user to study the principles of nuclear fission, then to see them exploited in a Magnox nuclear reactor. The user may control a reactor in simulation in order to attain the highest level of megawattage output. A question and answer test is included.

What makes AVP packages so suitable for the classroom is that the needs of teacher and pupil have been carefully considered. There is extensive input error-trapping. The ability to repeat sections, revise particular points or move forward allows the maximum flexibility in use. Graphics are clear and yet detailed, and the step-by-step approach means pupils and teachers may work at their own pace. The language is tailored to the age of the pupils and not too simplified.

AVP produces software packages covering all the sciences from primary up to A-level, economics and business studies, geography, maths – including statistics – modern languages, music and a range of utilities for file-handling and graphics.

Details from AVP Software, Hocker Hill House, Chepstow, NP6 5ER. Tel: (02912) 5439.

Plotter discounts for schools

Linear Graphics has made a big breakthrough by bringing the plotter into schools. Its ESS, Educational Support Scheme, provides large discounts on plotters, software and associated peripherals. Savings of 25 per cent on most of the Plotmate variants and 30 per cent on the A3 mean that for £300 schools can have the choice of either an A3 or an A4M.

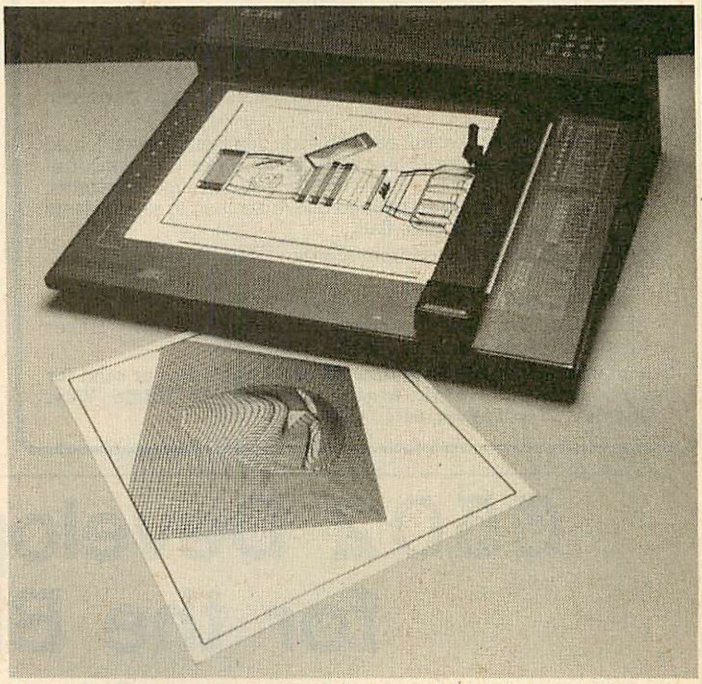
A plotter is a computer-controlled device which draws on paper using coloured pens. It differs from a dot-matrix printer by tracing the picture outline rather than building it up on a 'scanning' principle. The output is of a much higher quality and looks hand drawn.

It also allows the use of multiple colours and will shade, print text, reduce and enlarge the output. The Plotmate follows BBC graphics commands and can be linked to any software which produces its screen display in that way.

Why should a school want a plotter if it already has a printer? Printers produce low cost and generally fairly low quality graphics. The 'dotty' appearance and lack of sharpness make them a poor substitute for professionally printed or photographic materials.

Linear Graphics software allows schools to undertake the following tasks:

- *LINMAP*, a tracing utility allowing users to transfer the outline of a drawing or map to the screen by moving a stylus on the drawing head of the plotter and fixing the plotting points. The finished outline may then be filled with colour and the end result can then be plotted in a variety of sizes to paper or onto an overhead projector transparency.
- *LINSIGN*, a signwriting utility which produces clear signs of a professional appearance. Text may be of any size up to A3 single letters with facilities for shading, slanting, reversing and inverting the text. The screen image takes only a few minutes to generate.
- *LINCAD*, a sophisticated computer aided design package which exploits the plotter to its full capabilities.
- *LINTRACK*, a printed circuit board designer, producing a finished master ready to be etched. The editing facilities, in common with all Linear Graphics software, are simple to use.
- *LINTRONIC*, an electronic circuit designer using all the standard symbols. Circuit diagrams may then be plotted on the Plotmate.
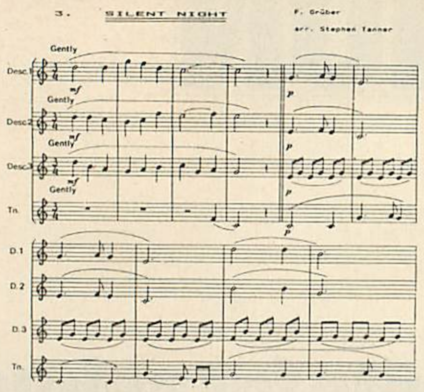


A Plotmate plotter offers schools increased graphics versatility

Plotmates come in two sizes – A4 and A3 – and the variants the A4M and A3M are 'intelligent' versions with their own onboard processors. Many packages from other software houses are now compatible with the Plotmate and the list is growing in size.

For the price of a printer, schools can have a highly sophisticated and versatile tool which which has applications in nearly every department. Details from Linear Graphics, 28 Purdeys Way, Rochford SS4 1NE. Tel: (0701) 541663.

MUSIC PRINTING



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* The new music processor from Mid-Sussex Software produces printed music to professional standards.
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* Individual parts extracted from scores.
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* Editing facilities.
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Cadsoft

Graphics Station

THE CADSOFT GRAPHICS STATION is a true 16 bit state of the art self contained graphics design computer which has applications in many areas, including graphic art, video production, education and business. Production of artwock of outstanding quality with speed and accuracy at moderate cost have been the development criteria of this user friendly package. The only additional equipment required is a good quality colour monitor to display the high resolution output. The GRAPHICS STATION is compatible with the BBC MASTER 128 series computer and it will also run the new Master COMPACT software. Users of these machines already familiar with programming in Basic, will quickly develop an ease of providing their own specialist software applications in addition to the CADSOFT material.

This dedicated graphics processor has one megabyte of screen memory and 128K of program memory. It uses twin 3.5 inch disc drives with the optional addition of a 10 or 20 megabyte Winchester disc drive, and has a built in high resolution 9" green screen monitor. Its three processors can be supplemented by an MS DOS co-processor giving an adiitional 512 K bytes of memory, or the 32016 scientific processor with 1 megabyte of program memory. The built in graphics tablet provides high resolution with 250 points per inch, a high quality stainless steel pen and an optional cross wire cursor.

* Broadcase quality resolution – 832 × 575 pixels with full genlock and key facility. Frame grab available soon.
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The complete system (excluding external colour monitor) is priced at a modest £5,200 plus VAT. The comprehensive GRAPHIC DESIGN software package is £450 plus VAT.

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EDUCATION

NEWS

Third World Awareness

The Centre for World Development Education has launched a computer software project to produce Social Studies and Moral Education titles.

Its first offerings, *Sand Harvest*, *What do We Eat* and *Water Game* try to develop awareness of differing lifestyles in the Third World.

Sand Harvest is a simulation which looks at the viewpoints of three different strata of society in Mali – nomad, villager and Government officer. The role play and simulation study attitudes to desertification and its consequences. The package, with comprehensive background material, costs £25 and is available on approval.

The Richardson Institute for Conflict and Peace Research also provides this type of software, and has produced a package entitled *Worldwise*. It studies the deployment of nuclear weapons. The package allows users to home in on areas of the globe and examine in detail the arsenal available. Games and simulations based on the package are suggested.

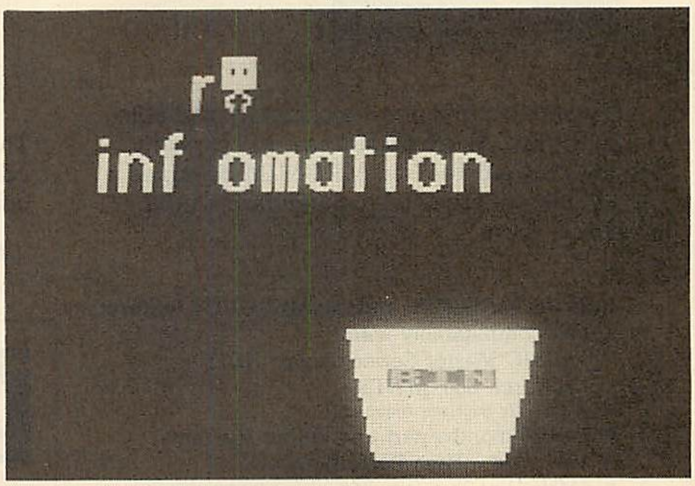
Worldwise (£8), Richardson Institute for Conflict and Peace Research, Dept of Politics, University of Lancaster.

CWDE, Regent's College, Inner Circle, London NW1 4NS. Tel: 01-487 5474.

Free spelling checker

The concept of Shareware comes from the States. Some American software manufacturers decided that in order to sell their product they would first of all give parts of it away.

The concept is that users would be so delighted with the new free package that they would sit down and write out a cheque in gratitude. This optimistic philosophy has now been refined so that a simplified program is distributed free but users are encouraged to buy improvements.



***Starspell's* animated correction sequence**

This is Fisher-Marriott's ploy. Their program *Starspell*, which originally came out as *Wordspell* through Griffin and George, is available free to any school which cares to copy it.

All LEA computer centres have received a copy of this program and Fisher-Marriott will make a copy for you if you send them a formatted disc and stamped addressed envelope.

The program is a spelling tutor with more than 900 words using an interesting correction sequence. Screen display is large and clear.

Details from Fisher-Marriot Software, Forest Hermitage, Lower Fulbrook, Warwicks, CV35 8AS (0926) 624385.

Database project ideas

What do you do with a database? Having bought a database package, many schools wonder what to do with it.

Help is at hand in the form of the BBC and AUCBE, the Advisory Unit for Computer Based Education. The BBC has produced the *Nature Database Projects* booklet which covers the stages required to set up projects for lower juniors.

Projects covered are bird observation, plant growth, caterpillar observation, weather, eye colour and taste. They have all been tried and tested by schools in Hertfordshire and developed in co-operation with John Levett of AUCBE.

The booklet is available for £1 made payable to the BBC. The address for orders is: The Producer, Looking at Nature, BBC Schools Radio, 1 Portland Place, London W1A 1AA.

John Levett's name crops up again in the second package – available direct from AUCBE – which takes the idea a stage further. The new AUCBE pack covers history, houses, journeys to school, rocks, accidents, water, sliding, people and a host of other topics.

For users of *QUEST*, at whom this was originally targeted, there are help charts for BBC and RML users, and comprehensive introductory material. The main body of material in the pack is not dependent on *QUEST* and may be used with any good educational database management system. Teachers will also find the material valuable as it gives many examples of children's work.

Inquiries to John Levett, AUCBE, Endymion Road, Hatfield, Herts AL10 8AU.

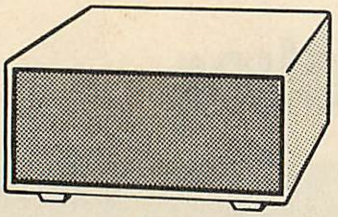
EDUCATION TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	B+	6502	Econet
1	Speech!	Superior	£ 9.95	£11.95	—	—	*	*	Yes
2	Number Chaser	Acornsoft	£ 6.99	£11.50	—	*	*	*	No
3	Words Words Words	Acornsoft	£ 6.99	£11.50	—	*	Yes	*	No
4	Best 4 Language	ASK	£19.95	£19.95	—	Yes	Yes	—	—
5	Best 4 Maths	ASK	£19.95	£19.95	—	Yes	Yes	—	—

Compiled by Gallup/Microscope. *Contact publishers: Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411. Superior Software, Regent House, Skinner Lane, Leeds 7. Tel: (0532) 459453. ASK, London House, 68 Upper Richmond Road, London SW15. Tel: 01-874 6046.

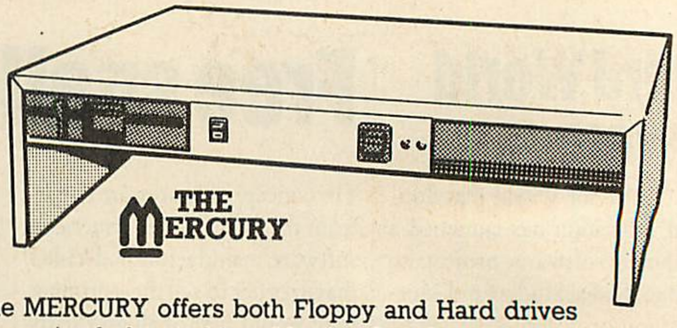
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MULTIVARIATE REGRESSION: Simple corr matrix, choice of dep var, selection of indep vars, noconstant reg. Selection-specific missing data handling. No. of rows and cols omitted due to missing values and multicollinearity. Output includes estimated coeffs, t-stats, std errors, R2, adjusted R2, std error of reg, F-stat, D-W stat, ANOVA of reg, var-covar and multiple corr matrices, interpolation, plot of residuals, plot of actual and fitted y values. Addition of residuals and/or fitted y values to data matrix.

STATISTICAL TESTS: Significance levels for most test stats. Test-specific missing value handling. PARAMETRIC: One sample t, two sample t with equal and unequal vars, paired t, F. NON PARAMETRIC: Chi-sqr and Kolmogorov-Smirnov, (both with equal and unequal exp freq versions), chi-sqr Bartlett, Mann-Whitney U for small, medium and large samples, Wilcoxon signed rank, Walsh, Wald-Wolfwitz runs. Kruskal-Wallis one-way ANOVA, Friedman pseudo two-way ANOVA, Jonckheere trend, Page's L, Cochran Q, Goodman-Kruskal gamma, Sommer's d. CORRELATION COEFFICIENTS: Pearson, Spearman's rho, Kendall's tau, Point biserial, Goodman-Kruskal gamma, Sommer's d, Yule's Q, phi, tetrachoric. DISTRIBUTIONS: Chi-sqr, t, F, Normal (std, non std), log, inverse and bivariate normal, binomial, negative binomial, exponential, hypergeometric, gamma function, Khrgian-Mazin.

DESCRIPTIVE STATISTICS: Analysis of raw data or data with freq counts. Raw data sorted and grouped. Freq dist with choice of lower bounds and class intervals. Absolute, cumulative and relative freq. Histograms, scatter diagrams and time series plots. Output includes sum, mean, mean deviation, median, variance, std deviation, third and fourth moments, skewness, kurtosis, range, etc.

ANALYSIS OF VARIANCE: One-way with and without repeated measures, two-way with no interaction, two-way and three-way with one, two and without repeated measures.

TABULATIONS: CROSS-TABLUATION: Two-way tables with col and row totals and percentages. CHI-SQUARE CONTINGENCY TABLE: Observed freq, exp freq and chi-sqr for each cell. Col and row sums, overall chi-square stat and its significance level. Yates correction.

HIGH RES PLOTS: All plots can be dumped on the printer. PLOT OF BIVARIATE REGRESSION: Scatter diagrams with optional line of best fit, intercept, slope, R2, std error. CURVE FITTING: Fitting of polynomials on bivariate data. Fitted polynomial coeff, R2 and std error. TIME SERIES PLOTS: Simultaneous plotting of up to 7 columns of data against time. PLOT OF FUNCTIONS: Simultaneous plotting of up to two functions, integrals, polynomials and roots of polynomials.

DEFAULT SETTINGS (For BBC version): Choice of screen and device control parameters. 40 or 80 column display, number of data drive 0/1/2/3, black & white or colour monitor width of printer, high-res screen dump command, maximum formula length, maximum number of columns and rows depending on free RAM.

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Written by Dr D. Sprevak

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Prices include post & packing within the UK. Official (government, university, local authority) orders are welcome. For orders from Europe add £5, from outside Europe £10. For BBC versions please indicate 40 or 80 track format. Cheques and correspondence to: **UNISOFT LTD, P.O. Box 383, Highgate, London N6 5UP.**

AN ELECTRON IN CLASS

How to expand your computer system without it costing an arm and a leg

Chris Drage and Nick Evans

Schools are very short of funds in these hard pressed times and certainly need no reminders of the fact! Schools wishing to expand their computer systems are faced with some traumatic financial decisions as both the Master 128 or RML Nimbus system each represent an enormous outlay for a primary school, especially when a new computer is weighed against the demands for added resources from other areas.

How can an enterprising school add another (affordable) computer to its existing BBC micro and yet remain largely software/hardware compatible? Purchasing a Sinclair Spectrum or a similar computer means relearning a new system and starting a software library from scratch. This could also prove to be an expensive exercise. One solution lies in the Acorn Electron 32k:

- It is affordable: £99.00 retail, or even as little as £45.00 at the recent Acorn User show! (Watch for pre-Christmas bargains in the high street stores.)
- It is largely software compatible with the BBC micro.
- It can share peripherals like disc drives and monitors that the school already owns.
- Children are likely to have Electrons at home, allowing a degree of educational, computer-based activity at home.



Children used to the BBC micro quickly adapt to the Electron

Electron history

What sort of beast is this Elk? The Electron was reviewed in the August 1983 *Acorn User*. In his article, Paul Beverley describes the Electron as having a number of shortcomings compared to the BBC micro. These included a lack of:

- an RS423 interface (for modems, printers)
- analogue to digital converter (for joysticks, light pens)
- 1 MHz interface bus (for hard discs/RAM discs)
- tube interface (for second processors)
- printer port
- user port (for Concept Keyboards, mice)
- sideways ROMs/RAM
- Mode 7
- 300 baud for the cassette filing system
- speed: at least 33%–44% slower than a BBC micro
- disc interface (for disc filing systems)
- auxillary power supply (for running peripherals like disc drives).

Obviously, Acorn decided to dispense with the above features to keep the computer's cost down, thus appealing to a different market. The computer was designed to be expandable by adding expansion units. The Plus 1 interface provides the Electron with two cartridge ROM sockets, printer port, analogue port. The Plus 3 unit provides a disc interface and 3.25in disc drive.

The result of all this was that an Electron cost more than a BBC micro to expand to a comparable level. Although about 180,000 have been sold to date, software support has remained thin and after an initial flourish, popularity declined.

By 1985 Acorn ceased making the Electron and its associated products altogether and had sold all its stocks to chain stores and interested suppliers. In the last year, however, the humble Electron has enjoyed a new wave of popularity. This has been due mainly to a number of third-party suppliers who have provided units which make the Electron more BBC micro-compatible than ever before, at an affordable price.

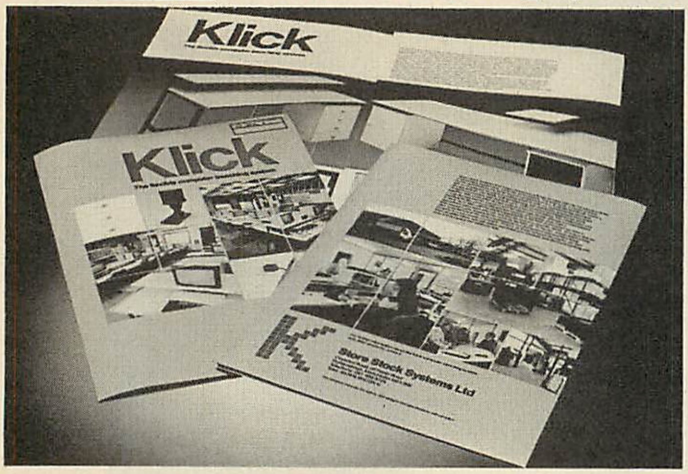
An Electron system

Having decided to purchase an Electron, the first problem is where to get one. Dixons and other stores will have stocks. Alternatively, explore the possibility of purchasing a redundant Electron from a parent or even suggest that the school would appreciate the donation of one! Computer shows and pre-Christmas offers are the best means of purchasing a new Electron cheaply. Once obtained, it is wise to get a Plus 1 interface and disc interface immediately and avoid the frustrations of using cassettes. The Plus 1 interface is available from Database Publications at £39.95.

Alternatively, the ROM Box+ available from Slogger Ltd offers improved Plus 1 operation and the ability to use sideways ROMs/RAM for only a little more money.

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The Klick flexible benching system has been designed for constructing free standing benching which can be assembled quickly and easily. The Standard range is available in 3 heights and can be supplied with a selection of underbench storage units. The Flexi range provides the scope for any unusual size, height or configuration required. For product brochure and price list please contact:
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Computers & Basic Education

Computer Programs

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(a) Programs focussing on: Gas meters and bills, Rates, Telling the Time, Punctuation, Spelling (2 discs), Crosswords (2 discs) and the 24 hour clock and timetables.
Price: £7.00 each double disc (postage 35p)
£5.00 each single disc (postage 35p)
£34.00 complete set of 7 (postage £2.00)

(b) 3 programs each containing 2 discs on Money, Multi-Maze and Con-Word (using a concept keyboard).
Price: £7.00 each (postage 35p)
£18.00 complete set of 3 (postage £1.00)

Computers in Language and Literacy Work by Janet Leonard

Published jointly with the ILEA, this handbook aims to help ESL and basic education organisers and tutors by surveying software and considering future developments. It is also a straightforward book for the non-expert.
Price: £2.50 (plus postage 50p)

Copies of these publications are available from:
The Adult Literacy and Basic Skills Unit Kingsbourne House, 229/231 High Holborn London WC1V 7DA. Tel: 01-405 4017

ALBSU
Adult Literacy & Basic Skills Unit

Even though the ROM Box+ has no analogue port, if you can afford one, it represents a more versatile option.

Disc upgrade

There are three companies offering disc interfaces for the Electron: Advanced Computer Products, Cumana and Solidisk. I recommend the Advanced Plus-4 disc interface from ACP. It is by far the most BBC/Master-compatible of the three. The advantages of AP-4 are many and I would refer you to Bruce Smith's review of the unit (in July '86 issue) for detailed analysis. For schools there are a number of features which make this product most attractive. Firstly, being fully Acorn-compatible and running 1770 DFS at E00 it allows the user to access a good deal of the BBC disc-based software that the school already uses. Secondly, because PAGE is kept to E00 it enables more tape-based software to be run from disc. This is important as much of the Electron software available is provided on cassette.

The rear of the AP-4 has a cable connector to take virtually any type of modern disc drive: 5.25in, 3.5in, double or single-sided. As the Electron has no auxilary power output, the disc drive must have its own PSU. Another point to keep in mind for those with older 40-track drives: these may not work with the latest 1722 disc controller chip in the AP-4 (and Master 128). It would be wise to obtain an 80-track, double-sided drive for optimum performance. I have used the Electron/AP-4 combination in the classroom for about two months now and have only praise for it.

Expansion

The Plus 1 is the obvious expansion choice as it is inexpensive. If, however, you have the funds available for a ROM Box+, then purchase this unit. I must confess to having been a little anxious at the exposed ROMs on its top and its very accessible cartridge apertures. The unit has performed admirably in the classroom environment, however, and once children are alerted to the need to keep their 'hands off the ROMS', they are very sensible about it.

I have since fitted a 16k sideways RAM card to the ROM Box+ which performs admirably as a printer buffer and with certain sideways firmware. *View3* works very well on the Electron even though the function keys are programmed differently and a new key strip had to be drawn up. The Plus 1 and ROM Box+ both provide a parallel printer port to which most popular printers may be attached. This really transforms the Electron into a serious classroom computer. A cost-effective printer to add to your system is the Centronics GLP. This 'great little printer' has performed well in the classroom and although a good bit slower than the school's FX-80, it is ideally suited for word processing and screen dumps from graphics packages.

There is no end to the possibilities opened up by the ROM Box+ and the AP-4. But these two items are enough to obtain a performance reasonably parallel to the BBC micro. The table below outlines approximate costs:

Lowest cost limit	
Electron (approx sale price)	£60.00
Plus 1	£39.95
AP-4	£79.98
	£179.93

Highest possible cost	
Electron (recommended retail)	£99.00
Rom Box+	£45.00
AP-4	£79.98
	£223.98

When you consider that a second-hand BBC micro costs in the region of £220–£250 then the Electron begins to look an attractive proposition. By buying at sale price or less the system looks very attractive indeed, especially for schools who wish to provide a second computer to run applications software like wordprocessors or maybe provide a second Logo work station. To this must be added a disc drive and monitor.

There is no end to the hardware possibilities. Joysticks like the excellent Voltmace Delta 3B may be added as an additional input device (to the Plus 1), or even a 6502 second processor to expand memory and increase the Electron's rather slow speed. Slogger Ltd offers a turbo board to help overcome the speed restriction. If this seems a little esoteric, then Advanced Computer Products is shortly to release its AP-5 interface which will give



The Electron and Plus-1 combined with the AP-4 make a basic system for schools

the Electron a tube, 1 MHz bus and user port. Good news for Concept Keyboard and mice users. Although these are not essential to our classroom Electron running applications software, the AP-5 nevertheless illustrates the point that an Electron system is not static and can grow as needs (and funds) dictate. The table of Electron deficiencies shrinks as the months pass, or so it seems.

Those lucky souls with Master 128s in their schools will enjoy the fact that Electron and Master share the same cartridge system. Thus Logotron Logo in a cartridge, for example, can be used between two computer systems. Advanced Computer Products makes a Master/Electron cartridge which is ideal for such applications.

Software

The ever thorny question is: 'What will run on it?' A good deal of software of interest to schools will run on the expanded Electron. Here we arrive at a major drawback to using the Electron with educational software – most of which is written for the BBC B in Mode 7. The Electron will run the software but Mode 7 screens are converted into Mode 6 with control codes producing some unusual characters. Most text-only screens are quite legible even though double-height becomes a double line of text! Any other mode seems to

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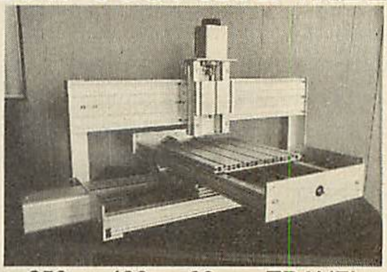
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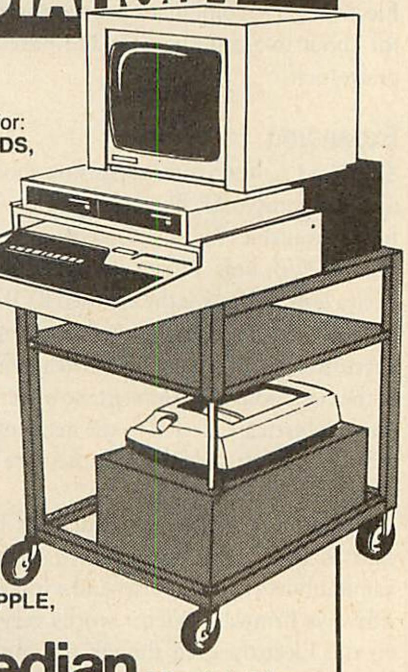
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be faithfully reproduced but runs very slowly, especially in Modes 0 and 1.

One of the first tasks is to convert tape-based software on to disc. This can be done by laboriously loading and saving. However, much of the tedium can be taken out of the operation by ACP's Advanced Disc Toolkit. A suite of 30+ ROM based utilities for disc users – Electron, BBC B or Master 128. The ROM may be fitted into the AP-4's central ROM socket which seems to be made for the job. Once fitted, the Electron has some very powerful disc commands at its disposal.

Although ADT will transfer all cassette-based software to disc (including the 'Locked' variety), it is no guarantee that the software will run from disc. As often as not, a line in the program issues a *TAPE command (or machine code CALL), which resets the machine to CFS. Only those with time, patience and programming expertise will be able to use ADT's sophisticated disc/memory editing facilities to adapt programs. However, many software packages will run, and it would be of value if readers write to us c/o Acorn User Education with their results of adapting worthy cassette software to disc.

To date I have used the Electron chiefly for wordprocessing and Logo work – two tasks to which it is ideally suited. You are spoilt for choice when it comes to word processors: *ABC* and *View* (Acornsoft) all run successfully. Unfortunately, *Pendown* and *Wordwise+* do not work as they both operate in Mode 7. However, Tedimen Software has promised that an Electron version of its excellent *Folio* wordprocessor will be available soon.

Logotron Logo runs effectively from a ROM socket on the ROM Box+ although younger children could explore Turtle Graphics (Acornsoft), transferred to disc using ADT. I have used *Dart* (AUCBE), as it is an excellent turtle graphics package. Released on disc, it runs successfully on both the school's BBC micro and the Electron. It represents an extremely cost-effective means of getting more children interacting with this aspect of Logo.

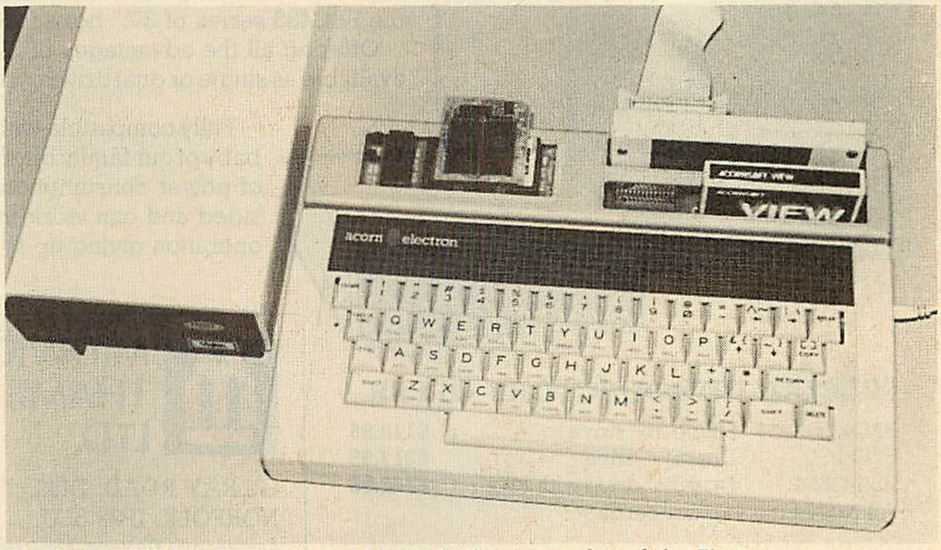
I have not fully explored adventure programs on the Electron as yet. Possibilities for evaluation are *The Magic Sword* (Database Publications), *Serpent's Lair* (Comsoft), and *Super Gran* (Tynesoft). Amongst the few simulation-type programs I have tried, I can report that *Osprey!* (Bourne Educational Software) and *Sir Francis Drake* (LCL) both run very well.

For younger children, most of ASK's software (now available from ESM) works with the Electron as does Mirrorsoft's *Mr Men* suite. *Podd*, a firm favourite with children, works beautifully.

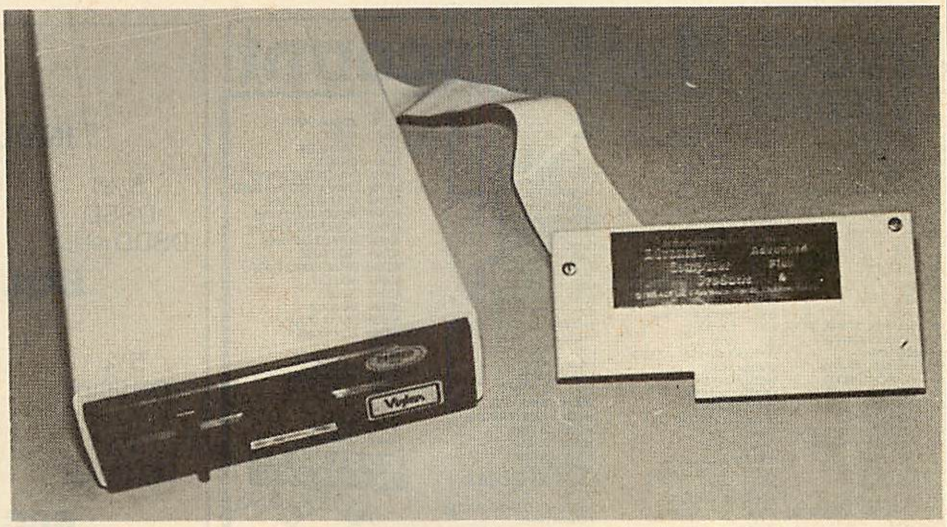
The novel and commanding *Read Right Away* series (HS Software) can be transferred to disc – all its BBC disc software runs very well also. This series provides practice at matching beginnings and endings of words to help children learn about the sounds that groups of letters make.

Among other primary software I have tested to date, *Maths With a Story 1 & 2*, *Word Play* and *Number Games* (BBC Soft), *Timeman 1 & 2* (BES), *Primary Time* (Alligator), *Answer Back Junior Quiz* (Kosmos) all work well.

The Electron/ROM Box+/AP-4 can utilise software and hardware already present in the school in a format familiar to everyone. It is possible that 3.25in discs may become the standard format of the future, but these discs are expensive items, at present costing anything up to £3.60 each. I prefer to use 5.25in floppies purchased at 50p each – every disc drive in the school can run them! Even though powerful micros are becoming more affordable by the month, the software library a school has acquired represents a hefty investment of both money and teacher familiarisation time. It makes sense to utilise these resources to the greatest possible extent. The Electron, suitably expanded, provides a means of doing just this.



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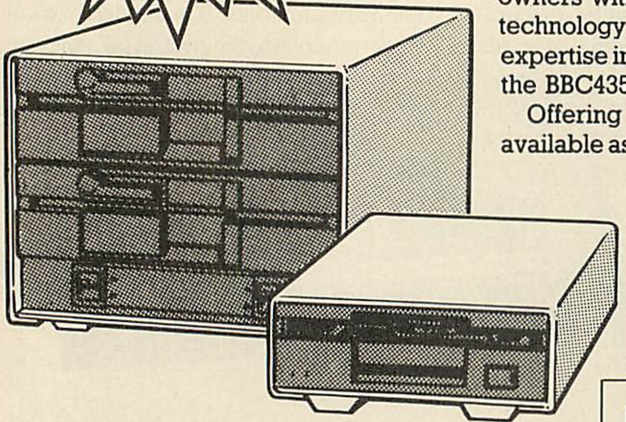
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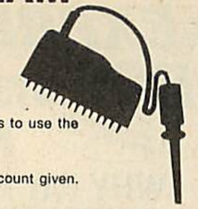
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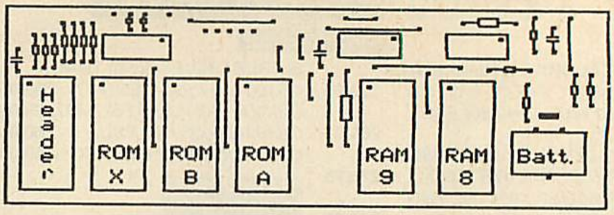
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SR293	9D(Mac)	3 way	£59
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PARALLEL PRINTERCROSSOVER SOLID STATE MANUAL

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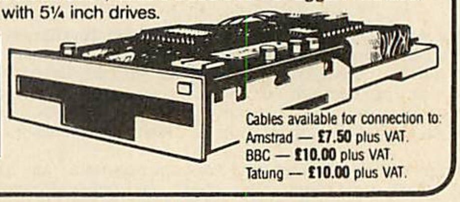
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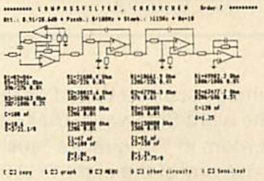
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Anyone seriously engaged in electronics design needs specific filters sooner or later. ELDESIGN II designs analog active filters in the range Order 0 to 8.

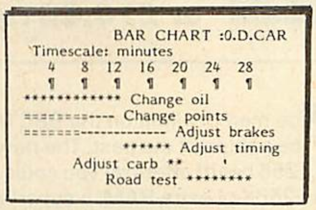
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For the filter stages and user may, in most cases, choose from Multiple Feedback, Sallen-Key and Anthoniou circuits. The software provides complete graphical representations of Linear and Logarithmic Gain and Phase graphs, Separate Stage graphs and freely selectable coordinates. Leaflet available on request. Demo disc £5.00 credited against purchase. Screendump routine written for the Star Gemini-10X matrix printer. The software contains a program to adapt the routine for use with other printers. Back-up disc supplied. Suitable for a single sided disc drive.

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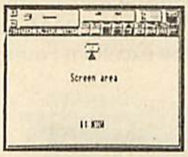


This program uses the PERT principle to organise projects (such as personal, corporate, educational, training projects etc.) in which numerous separate tasks are to be performed with minimum labour requirements at the lowest cost in the shortest time. It gives rapid estimates of costs and timescales, assessment of cashflow requirements, efficient allocation of labour resources and a 'What if' facility to gauge the effect of varying circumstances. The software can handle up to 64 tasks and 26 labour resources over 104 time units making it powerful enough to cover most applications. It contains two demonstration examples: a simple motor car service and a short printed circuit board development project. Each task is given a description, duration and cost. Where one task is dependent on others finishing, this is specified and taken into account by the software. The theory of Critical Path Analysis is applied to create a Bar Chart giving the overall duration of the project, highlighting tasks which are critical to the completion date and showing those where a degree of time float is available. Daisywheel and matrix printer outputs in serial or parallel are provided. Suitable for a single sided disc drive.

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*64 patterns for infill or background.
*Definition can be enhanced by the erasure of individual pixels.
*2D images can be transformed to 3D using the isometric functions.
*Mode 0 text can be enlarged to any size.
*Accurate measurements available using the x & y coordinates and a definable grid.
*Display is black on white or the inverse allowing easy hidden line removal for solid or see-through objects.
*7 selectable screen colours.
*Built in Epson screen dump but any other dump routine may be used.

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and it will be printed in a
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easily be able to read or copy.
Just like this...

Devised by an experienced Primary teacher Junior Script allows all kinds of worksheets or display labels to be easily printed in the above consistently neat proportionally spaced style. All pieces may be prepared in advance without the need for a printer to be attached and stored on disc for future use or they may be printed out immediately. Four accurate copy lines for handwriting exercises can optionally be added below each line of text or a page of black copy lines can be printed. A 40 track disc will hold up to 30 titles with a total of 600 lines of text and any number of discs may be set up allowing for example each teacher to have their own disc. Children find Junior Script helpful with reading difficulties as well as writing and also enjoy using the program as a simple word processor. For Canon PW-1080A or Epson FX compatible printers. Suitable for a single sided disc drive.

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SOLIDISK SUMMER SPECIAL OFFERS

£40.00 Cash Allowance for your old ROM Expansion Board when you trade in for the Fourmeg 256K

or £10.00 reduction if you already have Solidisk DFS

The memory limit on the BBC Micro can now definitely be a thing of the past. The new Solidisk Fourmeg 256 board offers all you could wish for.
It has 256K of extra RAM, a superfast 4MHz CMOS processor, sophisticated memory management, sockets for high capacity ROMs and 48K of software in ROM.
In fact, it contains even more devices than the BBC itself. It is compatible with most hardware add-ons — except Sideways ROM expansion, which explains why this special offer.
Fitting it is easy. You remove the existing processor from its socket and plug the new board in its place, push on three colour-coded wires, clip on two mini-hooks and it's ready.
Switch on the computer and you will immediately see the difference.
The message "Solidisk 256K expansion (4MHz)" announces the new memory size and speed.
A switch at the back lets you select between the old (2MHz) and the new (4MHz) speed.
The BBC Micro at 4MHz easily surpasses the new MASTER 128K on benchmarks.
For example, it runs the benchmark using Basic 4 in only half the time taken on the MASTER 128K.
If you have too many ROMs to plug in at once, the Fourmeg 256 offers TWO ways out. First, it includes additional high capacity (and fast) ROM sockets. Moreover, two or four normal ROM images can be stored in one high capacity ROM chip (by "Vertical Paging") — so more can be made immediately available at your fingertips.

Secondly, ROM images can be stored on discs and loaded into any one of the eight Sideways RAM banks available.
If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks.
No user memory is then lost to the screen, whatever the screen mode (while machine coded programs can access RAM right up to &FC00!).
Two frequent uses of the extra memory are as a RAMDISK or a printer buffer.
Star commands in the ROM can turn the extra RAM into a silicon DISK of 200K, compatible with both the Solidisk DFS and ADFS formats. The RAMDISK is at least 10 times faster than physical disc drives as it has no moving parts.
The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.
In addition, the MANAGER ROM offers over 30 star command utilities to save time and effort using the computer.
To complement such a powerful product, Solidisk has arranged with Computer Concepts to bundle the famous WORDWISE PLUS wordprocessor ROM and manuals. This excellent product, worth £45.00 on its own, became the best selling wordprocessor for the BBC computer last year.
All in all, the Solidisk Fourmeg 256 offers an unmatched combination of speed, power and built-in facilities, while still having room for even further expansion. It is the most logical next step for the owners of any Sideways ROM board or of Solidisk Sideways RAM, who can trade in their present boards for the excellent Fourmeg 256.

Yes! I want to take you up on your special summer offer

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- [√] **£135.00 instead of the normal price (175), I will send you my old ROM board when I have been satisfied with your Fourmeg 256.**
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If for any reason I am not entirely satisfied with your product, I will return it before 15 days and have all my money back (except postage if applicable)".

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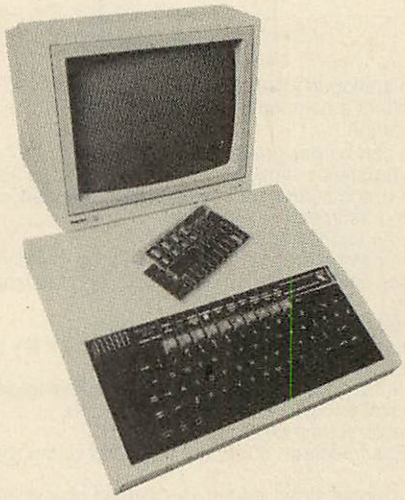
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We reserve the right to change prices and specifications without notice for improvement.



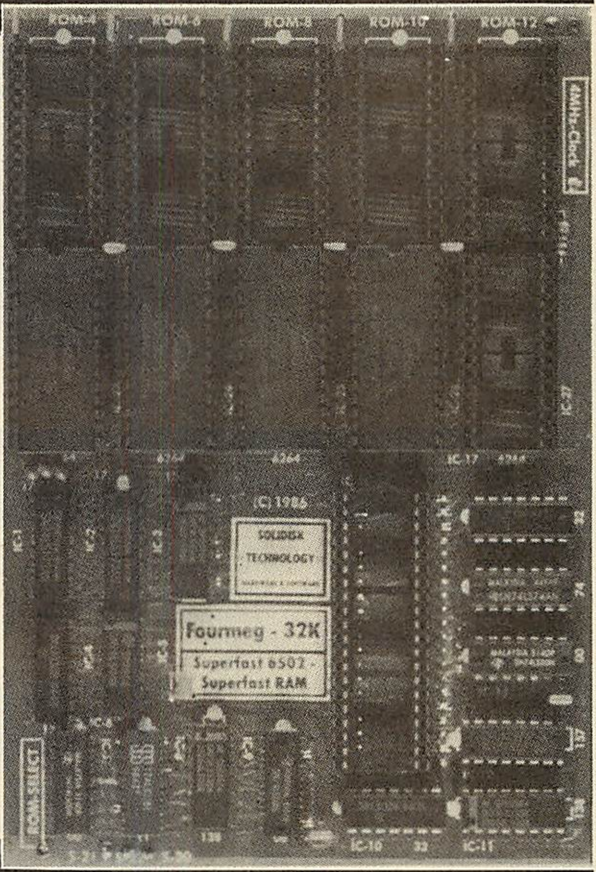
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SOLIDISK NEW DEVELOPMENTS

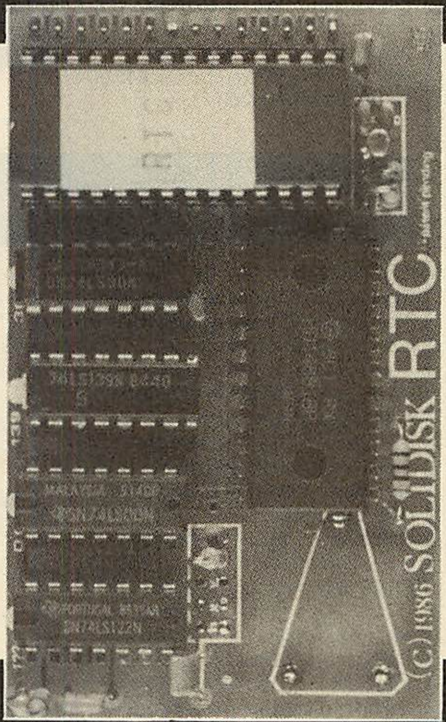
Shadow, Sideways ROM and Sideways RAM All-In-One for £50:



This board, the TWOMEG-32K, is specifically designed with the SCHOOL BEEB in mind so that one could have everything one wanted on a single, compact and extremely easy to install unit. All the necessary software is in a MANAGER ROM (supplied).
The top row of FIVE ROM sockets will take software ROMs, up to 32K each such as used on the BBC Plus and MASTER 128.
The middle row contains 32K of additional CMOS, low power RAM, acting as SHADOW RAM or as two banks of SIDEWAYS RAM.
The empty 40 pin socket will receive either the normal 2MHz CPU or the optional enhanced, faster 4MHz CMOS 65C02 (the board will be then called the FOURMEG-32K).
The TWOMEG-32K combined the usual functions of a Sideways ROM board — offering storage for up to 160K on board and 64K on the Beeb itself (a total 224K out of 256K possible) and a SHADOW RAM compatible with major 'language ROMs' such as BASIC, VIEW, WORDWISE, INTERWORD, VIEW-SHEET, VIEW-STORE etc.
When Shadow RAM is in use, a small 8K of Sideways RAM is available for loading ROM images or a small printer buffer. When SHADOW RAM is not in use, the entire 32K additional RAM can be used as TWO banks of SIDEWAYS RAM or as a RAM DISC (available only with Solidisk DFS or ADFS).
The MANAGER ROM also contains a powerful TOOLKIT to assist PROGRAMMING IN BASIC.
The attraction of the TWOMEG-32K board comes from its versatility, its convenient software in ROM and its low price tag. Furthermore, the board can be fitted with a CMOS 65C02 capable for example of running the new BASIC 4 (some 30% faster than BASIC 2 and also more accurate) or upgraded to FOURMEG speed, comparable to the TURBO board on the MASTER.

TWOMEG-32K	£50.00
65C02 (2MHz) for the above	£10.00
Or upgrade to FOURMEG	£25.00
FOURMEG-32K	£70.00

Real Time Clock & Desk:



The Real Time Clock and Calendar (RTC) can be plugged into any ROM socket on the BBC Model B with absolutely no other connection to make.
The Real Time Clock is powered by a rechargeable battery which should keep the RTC active throughout the Summer Holidays.
Apart from giving the Time and Date, through *TIME or TIME$ (BASIC 4), the RTC has many of the AUTO-CONFIGURE features of the MASTER 128K with the same command syntax, a friendly DESKTOP program for use with the AMX MOUSE, a DIARY and a Calculator.
Many additional commands are background commands, leaving your computer free to run your program. They set the time, display the clock in any screen mode, bleep at specified time, interrupt and show a message when you have an appointment, perform a specified task at specified time etc.
You can even 'Clock Boot' your computer directly into the DESKTOP, using the MOUSE you can operate the computer without touching the keyboard (ATARI-ST style) until you 'click' on a language ROM or an application program. You can pop down the pocket size calculator, change the time and edit your DIARY (instead of using a word processor).
The Real Time Clock will add fun and convenience to the every day use of your BEEB.

Order as CLOCK £29.00

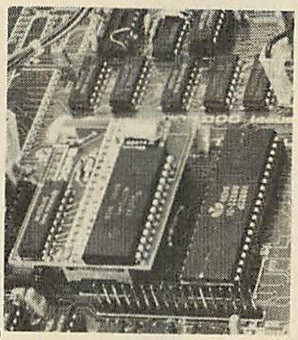
In Brief:

The range of Solidisk Add-Ons for the Beeb is quite extensive. For example: TWOMEG-32K ... £50.00, FOURMEG-32K ... £70.00, SWR64 with S/W pack 1 ... £60.00, SWR128 (new style) with S/W pack 1 ... £80.00, FOURMEG-256K with WORDWISE PLUS ... £175.00, DDFS (1770) ... £35.00, DFDC (1770+8271) ... £40.00, DFS 2.2 ROM ... £15.00, ADFS 2.1 ROM set ... £30.00, 3½ inch (80 track double sided) drive ... £90.00, 5¼ inch drive ... £109.00, 20MB Winchester with PSU ... £745, Linemaster communication ROM ... £10.00, Insight intelligent disassembler ROM ... £15.00, Solimon machine code monitor ROM ... £10.00, Toolkit ROM ... £10.00, S/W pack (1 to 3) of 5 discs ... £10.00, 2764 EPROM ... £1.00 each, 27128 ... £3.00, 27256 ... £6.00, EPROM programmer for 2764/27128 ... £19.00, EPROM programmer for 27256 ... £21.00, EPROM Eraser ... £20.00.

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SOLIDISK BUDGET DISC SYSTEMS

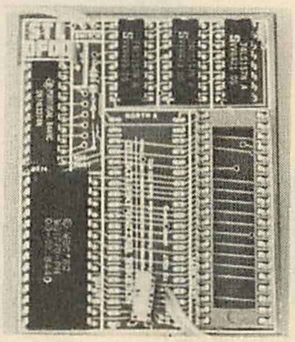
Double density disc interface



Solidisk very popular Double Density Disc Filing System (DDFS) is based on the WD-1770 floppy disc controller, the same chip used on the Beeb-Plus and the Master series, totally hardware compatible with Acorn 1770 DFS and ADFS ROMs. The DDFS is suitable for virtually any type of floppy disc drives, 3½" and 5¼", 40 track and 80 track, single and double-sided with or without power supply unit. New low price without DFS ROM .... £35.00 (order as XR/DDFS)

1770+8271, dual floppy disc controller interface

Solidisk DFDC (1770+8271) is the best seller in disc upgrades for Model B's already fitted with an INTEL 8271 chip (Acorn, Watford, Pace, Viglen, Cumana etc). It plugs into the 8271 socket with the latter relocated on the DFDC itself. This is the most convenient way of adding the modern and powerful 1770 without sacrificing the 8271 chip. The DFDC is fully hardware compatible with both Acorn DNFS 1.2 and ADFS ROMs, as well as Solidisk DFS 2.2 and ADFS 2.1 ROMs. The Acorn DNFS 1.2 is recommended for use jointly with the Solidisk ADFS 2.1 as both systems 'self-frugalise' to keep PAGE at the lowest value. We recommend the DFS 2.2 ROM alone if ADFS is not required. New low price without DFS ROM .... £40.00 (order as XR/DFDC)

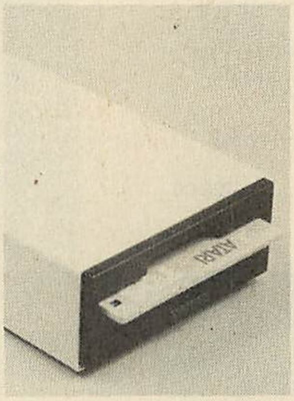


Low cost 3 ½ inch disc drives

The new generation of THIRD HEIGHT 3 and a half inch Floppy Disc Drives offers unprecedented value for money. They feature Double-sided, 80 track per side mechanism offering up to 640K per disc in double density and ADFS. Low power, large capacity, extremely quiet mechanism, robust media and LOWER PRICE than 5 and ¼ drives make them irresistable. They are also the newly adopted Acorn disc standard. Cased, all leads. One year guarantee.

Order as 3.5 INCH-DRIVE (80 track/Double-sided) £90.00

FREE demonstration diskett (double sided) in DFS format while stock lasts (containing a Database, a Word-processor and a selection of games and disc utilities). Separate power supply for BBC Model B, issue 2 or Electron is available at £25.00. Order as 3.5/PSU.



Special leads

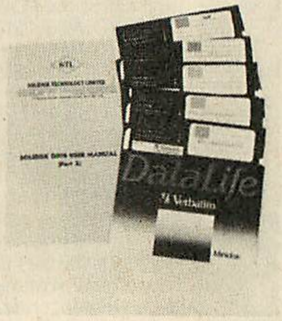
A Special set of leads to connect TWO drives in ANY combination of 5¼ and 3½ drives is available separately at only £15.00 or only £8.00 surcharge if supplied in lieu of standard leads. Order as SPECIAL LEADS.

Advanced disc filing system ROM-set (two 16k EPROMS) version 2.1

The finest product yet for any BBC computer fitted with the 1770 Floppy Disc Controller (Model B, Plus and Master 128K and Electron) encompassing many Master 128K specifications. The list of features is so extensive that it would require a lot more space to describe it. In brief, it has ALL the features of the 2.2 DFS ROM except device drivers for the INTEL-8271 chip, full ADFS implementation comparable to the MASTER 128K. Plus ADFS-FORMAT (FORM40, FORM80 and FORM160) and VERIFY. Plus MVDFS and MVADFS to transfer files between DFS and ADFS formats with automatic PAUSE for disc change rendering possible to operate with a single drive. Low PAGE value. Compatible with 6502, Z80, 32016, 80186 (Master version) Second Processor. Two manuals.

Normally £30.00 but if order with DDFS or DFDC only £20.00

Please mention computer model when ordering. Order as ROMS2.1S. Also available on a single 32K EPROM as ROM2.1/32.

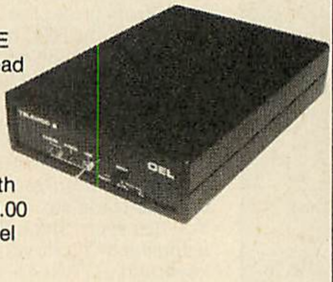


Single and double density disc filing system ROM version 2.2

The most powerful and versatile DFS ROM available for the BBC model B, the BBC Plus and the Master 128K. Suitable for both 8271 and 1770 Floppy Disc Controller. Double density allows up to 60% increase over conventional format or 640K storage per (80 track double-sided) disc. Extensive features include 40 and 80 track software switch, unlimited filenames in catalogue (as opposed to Acorn 31), automatic Read after Write. It works with Z80, 6502 second processors and Econet and also is very fast on comparative review benchmarks. Built-in commands include FORMAT (F40 and F80), VERIFY, DZAP, MZAP, RECOVER, RESTORE, WORD, RTRACK, WTRACK etc... Also, ENABLE M allows IBM PC discs to be read or written to. Extensive User Manual covers many technical details. Supplied on 16K EPROM.

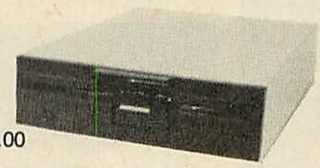
Normally £15.00 but if order with DDFS or DFDC only £10.00

Please mention computer model when ordering. Order as ROM2.2.



Unbeatable quality 5 and ¼ inch disc drives

Also available are NEC or MITSUBISHI 5 and ¼ inch, 80 track, double-sided drives at a very attractive price. Cased in matching cream colour, all leads. Only £109.00



Free bridge unit for twin drive systems

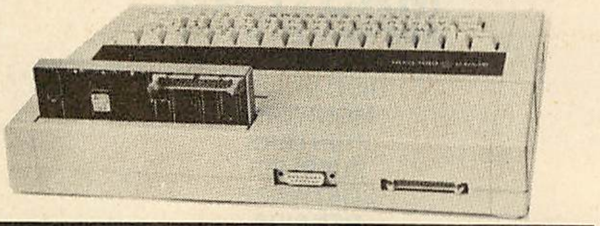
If you pay for two drives on a single order, we will offer you, absolutely FREE this practical BRIDGE unit. Solid steel construction, suitable for all Models of BBC and Master 128K.

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SOLIDISK AUTUMN SALE

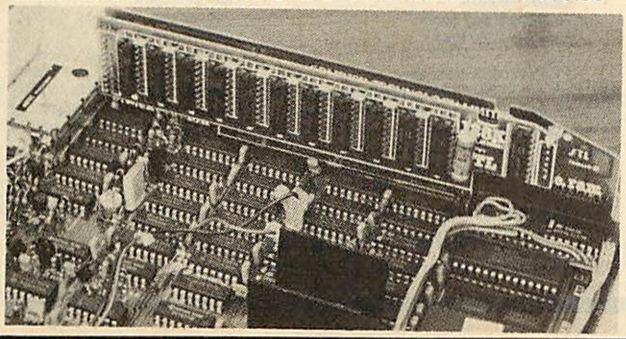
Electron Disc Interface:

This unit (EFS) plugs into the PLUS-1 Expansion and allows connection of a twin disc drive system and a Winchester. The Disc Interface is based on the same WD1770 chip as used on the Beeb. The Electron Disc Filing System software in ROM (32K) is a version of the Solidisk ADFS 2.1 thus offers a large degree of compatibility with Beeb software. The system is capable of both Beeb DFS format (single and double density) and ADFS format as used on the Acorn PLUS-3. The unit also has a 16K of Sideways RAM which can be used to load ROM images. The unit is guaranteed for one full year but we warn the users that the built-in Sideways RAM is UNRELIABLE hence the reduced price of only: ....£50.00.
Use a disc system with built-in power supply unit.



Old Style SWR32 and 128K:

This exceedingly popular system (30,000 plus units sold) enables the Beeb user to load one or two ROM images into the Beeb, make a 16K printer buffer, use DFS with PAGE at &E00, play games, run bigger BASIC, store music and inumerable other uses as supported by a library of 15 software diskettes.
The SWR32 system consists of a BASE UNIT which plugs into the rightmost ROM socket on the BBC board and a (exchangeable) RAM CARD. The RAM CARD also has extension socket for a piggy-back memory board capable of bringing the extra memory to 128K bytes of RAM.
This system is now superseded by the new FOURMEG series and therefore offered at a knock-down price of ONLY £20.00 for a complete unit, excluding software. The 96k add-on piggy-back memory board is also greatly reduced.
Order as SWR32 ....£20.00
Order as SWR128 (SWR32 with 96K extension) . £50.00
NB: Manual supplied but software (not strictly required) not included.
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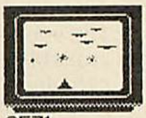
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ACORN FORUM

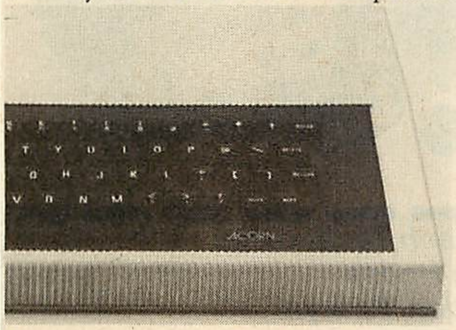
Mike Barwise and David Johnson Davies introduce notes for Atom and Electron users including screen dumps, booting, converting machine code and Tak functions

Little has been offered recently on these pages for the Electron and Atom users among us. This was not due to any policy decision, but rather because nobody sent me anything suitable. This month I am redressing the balance with a listing and some Atom and Elk hints.

First of all some notes on submissions to these pages. I get lots of submissions which can't be used for various reasons:

1. They use unusual hardware configurations.
2. They use facilities in less common utility ROMs that most users don't have.
3. They duplicate features already documented in the User Guides or Advanced User Guides.
4. Hand-written listings without accompanying disc or tape.

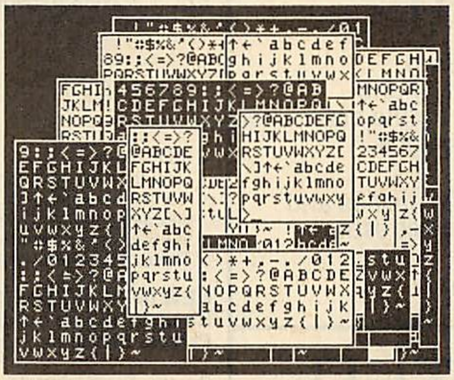
Unless your listing is really only a maximum of say 10 short lines long, I need a disc or tape. Otherwise I spend all my time typing in and debugging listings, which is impossible. Lines of 255 characters are not on either. Remember the width of a column: ideal lines should be about 24 characters long including the line number, but lines up to 40 characters are acceptable. Also, print statements containing strings of spaces are horrid for readers to type in correctly so use TAB or the SPC operator.



Atom users are alive and well

£10 ATOM SCREEN DUMP

Our first item is for the Atom, and comes from John Ferguson, whom readers will remember for his information on the Intelgraph VDU board. It is a very nice screen dump (listing on page 195), which gets round the Atom problem of having only a



Atom screen dump

seven bit printer port. His printer is a Kaga, which is Epson compatible, but the listing is sufficiently well annotated to allow Atom users with different printers to modify it to suit.

As an example of the dump quality, John has sent me a screen from Alan Knowles' very fine Screen ROM. The dump can use almost the whole width of the paper by doubling up dots in both directions. A very nice piece of programming, and well worthy of the crinkly brown ten pound note (computer printed cheque) we're sending you, John.

CONVERTING ATOM CODE

Next there is an appeal from Phil Tee of Birkenhead for information on converting Atom machine code to Electron. Well, Phil, it's not quite like that. The machine code is all the same, it's a question of whether or not the writers have made calls to routines in the OS ROM of the source machine. If so, you will have to find these calls and duplicate their function. This is done by either finding an equivalent routine in the OS ROM of the target machine, or by writing a suitable routine yourself. You'll probably have to do quite a lot of studying before you feel at home doing this. There is no 'conversion programme' to do it. It would not be impossible to produce one, but probably impractical. The depth of knowledge of both machines that would be needed, and the sheer size of the resulting program, make this a non-starter in commercial terms.

Your real hope is to go through your source machine code and annotate it, making sure you really understand what each routine is doing, then write a new program on the Electron to do the same job. All I can do is wish you luck – it's a massive task!

BOOTING THE ELK

A small but important tip from Graham Dean of Darwen, Lancs, about Electron expansion. His Electron Plus 3 system running disc was expanded by the addition of a Plus 1 recently. For simplicity, he keeps all his ROM cartridges plugged in all the time.

Graham has found that in order to allow the auto boot to function properly, the first line of the booted file must be 10 BASIC, otherwise the Elk crashes. As far as he knows (or I know) this is not documented anywhere. Well, now you know

LACK OF MEMORY

Now a word of caution for the BBC micro user about the 1770 DFS and ADFS utilities. It is not obtrusively documented just how much user memory some of these use up. Let's take Format as an example.

The 1770 DFS stores its track data file from &2000 to &2D02, and the ADFS stores its from &3000 to &49F2. This means that if you find you have run out of formatted discs just after writing your program, you have a problem – formatting a disc will destroy the program. There is no fix for this except to make sure you have a formatted disc before you start programming.

In all fairness to Acorn, there is a single note of this problem in the supplementary notes sheet to the Disc System User Guide, but it's easy to miss. You have been warned!

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10 ?35=£00;?36=£28
20 REM SCREEN DUMP FOR KAGA
30 REM OR EPSOM COMPATIBLE
40 REM PRINTERS
50 REM BY JOHN FERGUSON. 8/86
60 DIMPP7
70 F.Z=0TO7;PPZ=-1;N.
80 S=£XXXX;REM INSERT LOCATION OF M/C
90 J=£FF10
100 W=S-1
110 L=S-2
120 C=S-3
130 T=£90
140 D=£92
150 P.$21
160 F.Z=0TO1;P=S
170[
180:PP0
190 LDA@32
200 STAW SCREEN WIDTH IN BYTES
210 LDA@64
220 STAL 64 LINES OF 6 BITS
230 LDA@£00
240 STAT
250 LDA@£80
260 STAT+1 STORE SCREEN START ADDRESS
270 LDA@2
280 JSR£FEFB SWITCH ON PRINTER
290 LDA@£1B ESCAPE CODE
300 JSRJ
310 LDA@64 RESET PRINTER
320 JSRJ
330 LDA@£0D CARRAIGE RETURN
340 JSRJ
350 LDA@£1B ESCAPE CODE
360 JSRJ
370 LDA@£41 SET DOT LINE SPACING
380 JSRJ
390 LDA@6 NO. OF DOTS
400 JSRJ
410:PP1
420 LDY@8 COUNT 8 SPACES
430:PP2
440 LDA@32 SEND 8 SPACES FOR MARGIN
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470 BNEPP2
480 LDA@£1B ESCAPE CODE
490 JSRJ
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510 JSRJ
520 LDA@0 NO OF DOTS-LOW BYTE
530 JSRJ
540 LDA@3 NO OF DOTS/256-HIGH BYTE
550 JSRJ
560 BEQPP4
570 BNEPP4
580:PP3
590 PLA
600 STAT+1
610 PLA
620 STAT
630:PP4
640 LDA@3
650 STAC
660 LDAT
670 PHA
680 LDAT+1
690 PHA
700:PP5
710 LDA(T),Y
720 LDX@0
730 STA£21C
740 STA£21D
750:PP6
760 LDA£21C
770 ROLA
780 STA£21C
790 ROLD,X
800 LDA£21D
810 ROLA
820 STA£21D
830 ROLD,X
840 INX
850 CPX@8
860 BNEPP6
870 CLC
880 LDAT
890 ADCW
900 STAT
910 LDAT+1
920 ADC@0
930 STAT+1
940 DECC
950 BNEPP5
960 LDX@0
970:PP7
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1020 JSR£FF10
1030 JSR£FF10
1040 JSR£FF10
1050 INX
1060 CPX@8
1070 BNEPP7
1080 INY
1090 CPYW
1100 BNEPP3
1110 PLA
1120 PLA
1130 LDA@£0D
1140 JSR£FF10
1150 DECL
1160 BEQP+4;JMPPP1
1170 LDA@£1B ESCAPE CODE
1180 JSRJ
1190 LDA@64 RESET PRINTER
1200 JSRJ
1210 LDA@£0D CARRAIGE RETURN
1220 JSRJ
1230 JSRJ
1240 LDA@3 TURN OFF PRINTER
1250 JSR£FEFB
1260 RTS
1270]
1280 N.
1290 P.$6
1300 REM LINK TO LOCATION OF M/C TO START
1310 E.
```

John Ferguson's Atom screen dump for Epson-compatible printers

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For Canon & Taxan Kaga users we recommend FONTAID in preference to Multi-Font NLQ.

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EXAMPLE OF MFNLQ FONTS

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Now included is a facility to issue '*' commands within a VIEW document.
To download new fonts within VIEW documents, the FONTAID ROM needs to be fitted in the BBC. (All other FONTAID facilities are available on both the FONTAID ROM & DISC). Fonts are always downloaded from Disc.

Fontaid is recommended to Canon & Taxan Kaga owners in preference to Multi-Font NLQ. As downloadable NLQ is a built-in facility of the Printer, full access to all the printers control codes is still allowed. The resolution of the FONTAID NLQ is also slightly higher than that of Multi-Font NLQ.

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CJE micro's

TESTING THE TAK

An earlier article in *Acorn User* (June 1986, p179) compared six different programming languages in their performance of the Tak function, running on the BBC micro. This update presents results for other languages, including ones available for the Acorn Z80 Second Processor, and looks in greater detail at the Tak function itself. I am grateful to readers for sending in results in response to the original article.

The Tak function is a highly recursive function which tests efficiency at operations common to most real applications, including subroutine calling and parameter passing. The particular value chosen for the benchmark is Tak (18,12,6), which gives the result seven, and runs in a convenient range of times on the languages tested.

Each benchmark is optimised for speed, and the results of all the benchmarks tested so far are shown in table 1, in order of speed. The code size is the number of bytes occupied by the actual Tak function, excluding the surrounding program and any interpreter that would be present in the case of interpreted languages. The code was found by compiling the program both with and without the function definition present, and taking the difference.

All of the languages tested in the original article were run on a 6502 Second Processor. As an interesting comparison, Marc Chang Sing Pang of the Netherlands submitted benchmarks for three languages available for the Z80 Second Processor.

The first of these is the Z80 version of BBC Basic, supplied by Acorn with the Z80 Second Processor. The Tak benchmark, given in the original article, is reproduced here in listing 1. The resulting time, 200 seconds, is slightly slower than the 6502 Second Processor version.

The second Z80 language tested was Turbo Pascal, published by Borland International, which runs under the CP/M 2.2 operating system; see listing 2. In the test version the time and set time functions were written using in-line machine code to call the BBC micro operating system, and these routines are not included in the listing. The code size of the Tak function was not measured for this version.

The language lives up to its name, giving an execution time of 13 seconds which beats all of the available 6502 languages.

The last Z80 language tested was a

```
   10 REM TAK FUNCTION
   30 TIME=0
   35 PRINT"FNT(18,12,6)=";FNT(18,12,6)
   40 PRINTTIME/100;" SECS."
   50 END
   60 DEFFNT(X%,Y%,Z%)IFX%<=Y%=Z%ELSE=
FNT(FNT(X%-1,Y%,Z%),FNT(Y%-1,Z%,X%),FNT(Z%-1,X%,Y%))
```

Listing 1. Benchmark for the Z80 version of BBC Basic

```
Program taktest for Turbo Pascal

{$A-}
{generate no absolute code option, allows recursive calls}

program taktest(input,output);

function tak(x,y,z:integer): integer;
begin
 if y<x then tak:=tak( tak(x-1,y,z), tak(y-1,z,x), tak(z-1,x,y) )
        else tak:=z
end;

begin { main program }
 write ('tak=',tak(18,12,6));
end.
```

Listing 2. The Z80 version of Turbo Pascal

```
main()
{
   puts("TAK(18,12,6) = ");
   printd(tak(18,12,6));
}

tak(x, y, z)
int x, y, z;
{
   if (y >= x) return (z);
   else
     return (tak( tak(x-1,y,z), tak(y-1,z,x), tak(z-1,x,y) ) );
}

printd(n) /* print n in decimal (recursive) */
int n;
{
   int i;
   if (n < 0) {puts("-"); n = 0 - n; }
   if ((i = n/10) != 0) printd (i);
   putch(n % 10 + '0');
```

Listing 3. The Z80 small-C compiler language

```
 10(* TAK TEST *)
 20 FUNCTION TAK (X,Y,Z:INTEGER): INTEGER;
 30BEGIN
 40IF Y<X THEN TAK:=TAK( TAK(X-1,Y,Z), TAK(Y-1,Z,X), TAK(Z-1,X,Y) )
 50ELSE TAK:=Z
 60END;
 70(*MAIN PRGM*)
 80BEGIN
 90SETTIME(0,0,0);
100WRITELN('Tak=',TAK(18,12,6),' Time=',MINUTES,':',SECONDS)
110END.
```

Listing 4. Tak benchmark for Oxford Pascal

```
 10 REM TABLE TAK FUNCTION
 20 DIM K%(18,18,18)
 30 FOR L%=0 TO 18
 40 FOR M%=0 TO 18
 50 FOR N%=0 TO 18
 60 K%(L%,M%,N%)=-1
 70 NEXT: NEXT: NEXT
 80 TIME=0
 90 PRINT"FNT(18,12,6)=";FNT(18,12,6)
100 PRINTTIME/100;" SECS."
110 END
120 DEFFNT(X%,Y%,Z%)
130 IF K%(X%,Y%,Z%)<>-1 =K%(X%,Y%,Z%)
140 IFX%<=Y% K%(X%,Y%,Z%)=Z%: =Z%
150 K%(X%,Y%,Z%)=FNT(FNT(X%-1,Y%,Z%),FNT(Y%-1,Z%,X%),FNT(Z%-1,X%,Y%))
160 =K%(X%,Y%,Z%)
```

Listing 5. Version of the Tak stores computed valves

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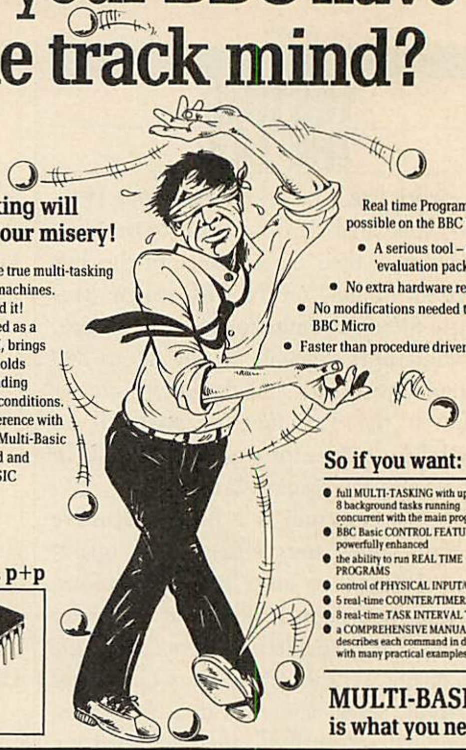
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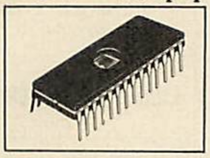
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small-C compiler which is in the public domain. The program, shown in listing 3, is similar in structure to the Pascal version. It includes a routine 'printd' to print the result in decimal, since this was not part of the compiler. The performance of this version is remarkable, at 9.5 seconds; it would be interesing to compare it to a hand-coded Z80 machine-code version of the benchmark.

Two readers have supplied timings for Oxford Pascal, an interpreted Pascal with integer and floating-point arithmetic for the standard BBC micro which was omitted from the original article. It is now available from Systems Software (Oxford) Limited. The Tak benchmark, submitted by T K Boyd of Petworth, Sussex, is shown in listing 4. The execution time is slightly poorer than Acornsoft ISO-Pascal, although the timing was performed without a 6502 Second Processor; with a Second Processor the positions would probably be reversed. Similar timings were also sent in by P S Williams of St Albans.

```
((tak X Y Z x)
  (LESS Y X)
  (SUM x1 1 X)
  (SUM y1 1 Y)
  (SUM z1 1 Z)
  /
  (tak x1 Y Z x2)
  (tak y1 Z X y2)
  (tak z1 X Y z2)
  (tak x2 y2 z2 x)
  (ADDCL ((tak X Y Z x)) 0))

((tak X Y Z Z))

((call X Y Z x)
  (TIME 0)
  (X Y Z x y)
  (TIME z)
  (PP y)
  (PP z))
```

Listing 6. Amended Micro-Prolog

Tak function

Several readers have asked for more information on the Tak function itself. The function is based on one originally devised by Ikuo Takeuchi of Japan as a means of comparing Lisp systems across several different computers.

Like the better-known Ackerman's function, Tak is deeply recursive. In the process of evaluating Tak (18,12,6) it follows a complicated sequence of 63,609 calls to itself before returning with the answer. As a simpler example, Tak (4,2,1) makes the sequence of 29 calls. So why does the Tak function take such a long time to execute? Although Tak (4,2,1)) makes a total of 29 function calls in the process of arriving at the answer, four, it often calls Tak several times with the same set of arguments. For example, Tak (2,1,3) is calculated twice, each time requiring a further four calls. Tak (18,12,6) makes 63,609 calls with just 281 different sets of arguments; a quick calculation shows that it is recalculating each value over 200 times!

```
   10 REM STRING TAK FUNCTION
   30 TIME=0
   35 PRINT FNT("XXXXXXXXXXXXXXXXXX","XXXXXXXXXXXX","XXXXXX")
   40 PRINTTIME/100;" SECS."
   50 END
   60 DEF FNT(X$,Y$,Z$)IF LEN(X$)<=LEN(Y$) =Z$ ELSE=
FNT(FNT(MID$(X$,2),Y$,Z$),FNT(MID$(Y$,2),Z$,X$),FNT(MID$(Z$,2),X$,Y$))
```

Listing 7. Tak function written in BBC Basic

Language	Code Size (bytes)	Time (seconds)
Assembler	215	2.64
Small–C (Z80)	116	9.5
Turbo Pascal (Z80)	–	13
S–Pascal	424 (machine-code)	19
FORTH	58	21
BCPL	60 (CINTCODE)	42
ISO-Pascal	68 (BL-code)	70
ISO-Pascal (FP)	80 (BL-code)	79
Oxford Pascal	64	97
BBC Basic (6502)	82	185
BBC Basic (Z80)	82	200
Basic (6502 – FP)	67	248
LISP	204	326
Micro-Prolog (FP)	366	359

Table 1. Comparison of Tak function timings

This observation immediately suggests a way to improve performance. A table of Tak values that have already been calculated is built up; when the same value is required at a later point, it can simply be looked up in the table rather than having to be calculated from scratch.

The method is illustrated by the Basic version of the Tak function in listing 5. This simply allocates an 18 x 18 x 18 table, with all the elements initially set to –1. Then, as values are calculated, they are put into the table. If space were at a premium the size of the table could be greatly reduced by efficient parameter encoding.

The improvement in performance is dramatic; the original time of 185 seconds is reduced to just 2.8 seconds, an improvement of over 50 times.

Micro-prolog is particularly suited to this type of optimisation. Values that have already been computed can be added as extra definitions by a very simple change to the program.

Listing 6 shows the amended Micro-Prolog version of the Tak function, which is identical to the version presented in the previous article apart from the ADDCL clause. This adds the result of each call to 'tak' to the database of clauses. Each new clause has the form (tak 2 2 3 3), where the last parameter is the result, and is added before the existing clauses so that they are encountered first.

Originally Micro-Prolog was the slowest of the languages compared; but this simple addition to the program improves the execution time by a factor of 16, giving a time of just 22 seconds!

The Tak function performs just two operations on its parameters; it subtracts one, and tests whether one parameter is less than another. Because of this, an equivalent non-numerical version of the Tak function can be written by using some other process to record the state of the function's three parameters.

As an illustration, the version of the Tak function in listing 7, written in BBC Basic, stores the three parameters as strings of X's (18, 12 and 6 respectively). It then uses string operations to compare the lengths of the strings, and MID$ to remove one character from the string.

The string version returns the result as "XXXXXXX", a string of seven X's. Not surprisingly, the result of 294 seconds was slower than the integer version. Even so, the Basic string version is surprisingly efficient, beating the Micro-Prolog version, a credit to the efficiency of BBC Basic's string handling.

As a challenge, can you find more esoteric non-numerical ways of implementing the Tak function?

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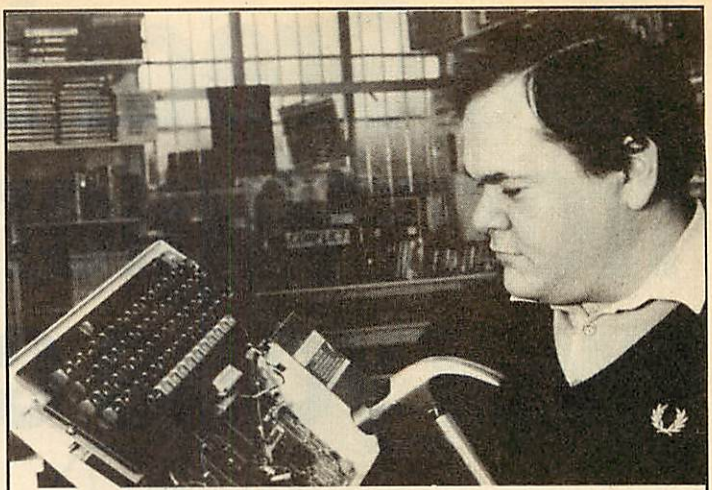
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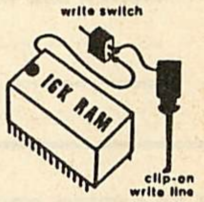
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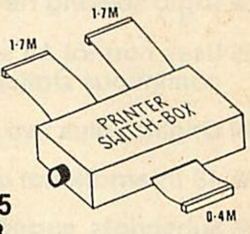
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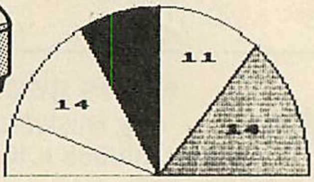


SAMPLE OF NLQ
(NEAR LETTER QUALITY)

```
The quick brown fc
jumps over the laz
The quick brown fc
jumps over the laz
The quick brown fc
```

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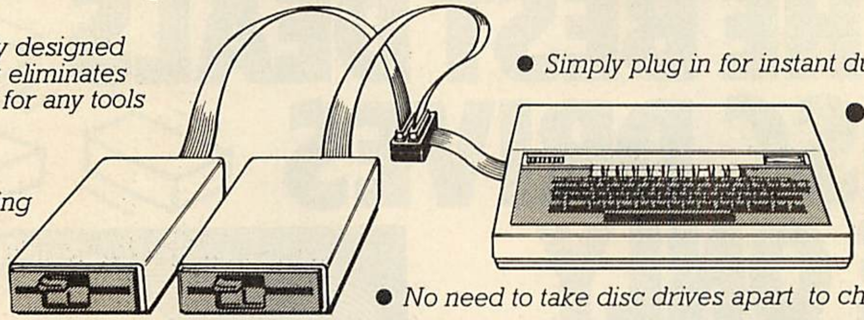
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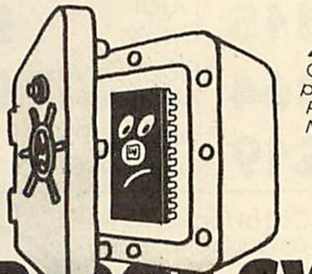
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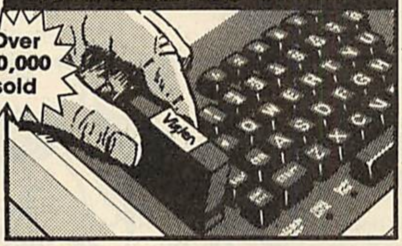
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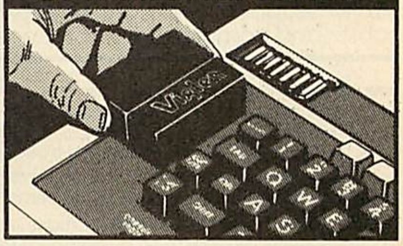
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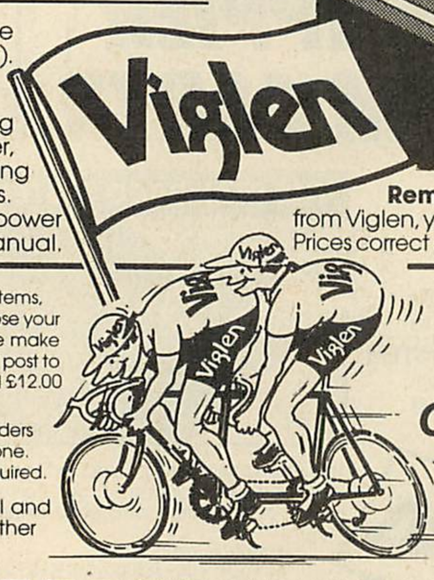
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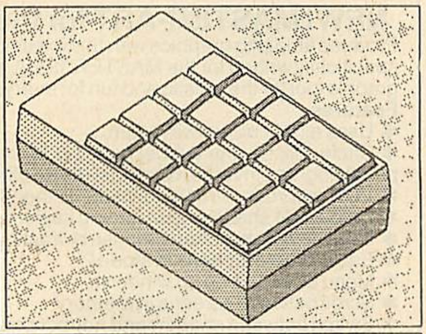
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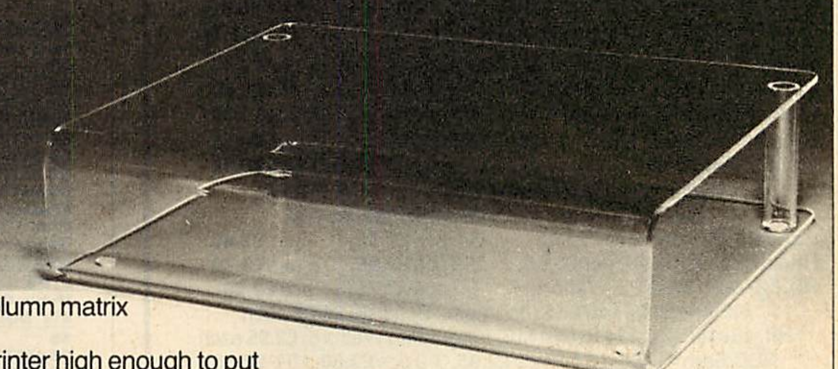
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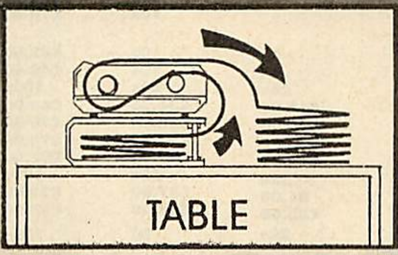
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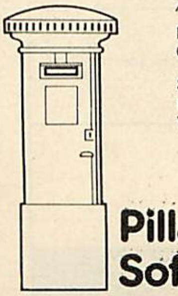
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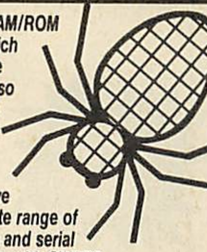
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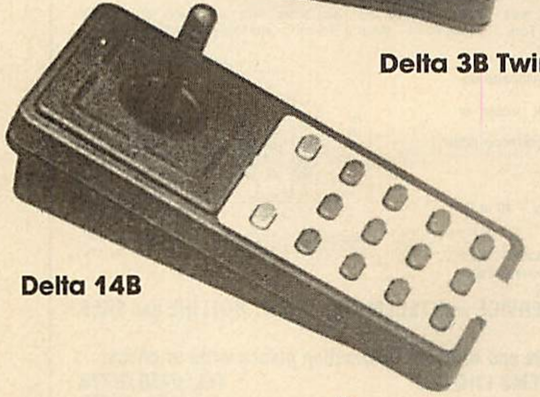
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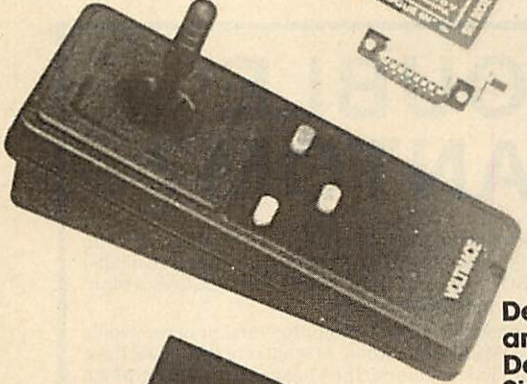
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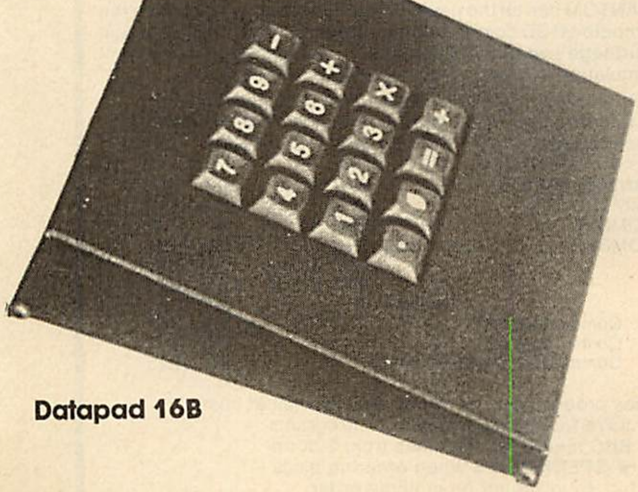
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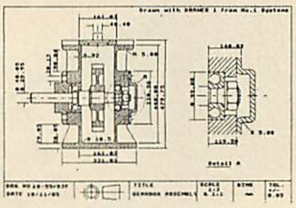
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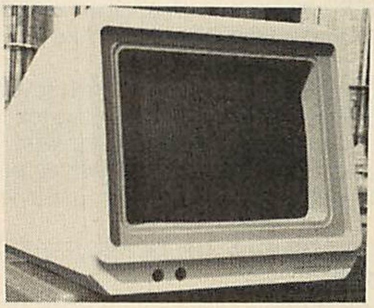


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Tel: 01-950 7068
Ilford. ILBUG: Peter Jones, 1 De Vere Gardens, Cranbrook, Ilford, Essex IG1 3EB
Tel: 01-554 9825
Iver. Iver Computer Society: John Haigh, 11 Colliston Walk, Ford's Farm, Calcot, Reading, Berks RG3 5ZJ
Tel: (0734) 417534
North & Mid Essex. User Group (NAMEBUG): Andy Purkiss, 12 Palm Close, Witham, Essex
Tel: (0376) 515609. Prestel: 376515609
Reading. Reading User Group (RUG): Richard Rowlands,
Tel: Reading 596825 (eves)
South East Essex. BBC User Group (SEEBUG): Miss J Lines, 97 Oakhurst Drive, Wickford, Essex SS12 0NW
Tel: (03744) 63396
Sutton. Sutton Library Computer Club: The Secretary, 21 Village Row, Sutton, Surrey SM2 6JZ
Tel: 01-642 3102
Welling. Computer Users Club: Tony Latham, 69 Hadlow Road, Welling, Kent DA16 1AX

SOUTH & SOUTH-WEST

Alton. Alton Computer & Electronics Society: Kevin Weatherhead, Sheen, Old Odiham Road, Alton, Hants GU34 4BW
Tel: Alton 87478
Bristol. Format 40/80 Club: BBC Disc User Group, Peter Hughes, 5 Marsh Street, Bristol BS1 4AA
Tel: (0272) 799979
Fareham. Porchester & Fareham Computer Club: Simon Ward, 9a East Cams Close, Downend, Fareham, Hants PO16 8RP
Gosport. Borough of Gosport BBC Users Group (BOGBUG), Graham Dubber, 128 Wych Lane, Gosport, Hants PO13 0TE
Tel: (0329) 282221 (evenings)
Radio. AMRAC (Amateur Radio and Computers): Mr T Triggel, Gleness, East Boldre, Brockenburst, Hants SO42 7WD
Tel: (0590) 612130

MIDLANDS & ANGLIA

Boston. Boston Acorn Computer Users Club: J C Goodwin, 245 Church Green Road, Fishloft, Boston, Lincs PE21 0RP
Burton-on-Trent. Beeb Users' Group (Bug Club): Mrs Linda Yeomans, 13 Regent Street, Church Gresley, Burton-on-Trent, Staffs DE11 9PL
Tel: (0283) 216445 (eves)
Cambridge. Bottisham Acorn User Group: Peter Rank, Tel Cambridge 812080, or Gerald Wilcockson, 19 Gallows Hill, Saffron Walden, Essex CB11 4DA
Tel: Saffron Walden 23793
Derby. The Derby Microcomputer Society: F Taylor, Secretary, c/o 5 Park View Close, Allestree, Derby DE3 2GH
Tel: Derby 559334
Glossop. Glossop Computer Club (Derbyshire): T S Fox, 4 Park Lane, Little Hayfield, Stockport, Cheshire SK12 5NW
Tel: (0663) 44260
Huntingdon. RAF Personal Computer Association: Sqn Ldr J A Upham, Man S (ADP), HQ RAFSC, RAF Brampton, Huntingdon PE18 8QL
Norwich. Amateur Computer Club: Andy Leeder, Church Farm, Stratton St Michael, Norwich NR15 2QB
Norwich. Norwich & District BBC Microcomputer User Group: Roy Street, Church Farmhouse, Themelthorpe, Dareham, Norfolk NR20 5PS
Tel: Foulsham 579
Nottingham. Micro Club: John Day, 8 Warkton Close, Chilwell, Notts NG9 5FR
Tel: (0602) 225660. Prestel: 602225660
Redditch. Redditch Computer Club: Anthony Green, 14 Radway Close, Redditch, Worcs B98 8RZ
Tel: (0527) 61434
Stoke. POTBUG BBC User Group: J Forest, 50 Cliff Street, Smallthorne, Stoke-on-Trent, Staffs
Tel: 818430
Stratford. Stratford Computer Club: Chris Parry, 15 Kipling Road, Stratford-on-Avon
Tel: (0789) 68080
Suffolk. West Suffolk BBC Micro Users' Club: Antony Hurden, 14 Plovers Way, Bury St Edmunds, Suffolk IP33 2NJ

NORTH-WEST

Cheshire. Mid-Cheshire Computer Club: Michael Christie, 496 The High Street, Winsford, Cheshire
Cumbria. West Cumbria User Group: P Majid Tel: (0946) 62732 or K Purkiss, Tel: (0946) 66586
Liverpool. Mersey BBC User Group: Nik Kelly, 56 Queen's Drive, Liverpool L4 6SH
Rochdale. Rochdale BBC Micro User Group: c/o 6 Dunbar Grove, Darnhill Estate, Heywood, Lancs OL10 3QJ
Wirral. Wirral Micro Users Club: David Walsh, 28 Priory Close, Bebington, Wirral, Merseyside L63 3EG

NORTH-EAST

Huddersfield. Huddersfield BBC Micro User Group: S Gill, 21 Mayfair Avenue, Sowood, Halifax, W. Yorks
Tel: (0422) 73058
Hull. Forum 80: 421 Endike Lane, Hull HU6 8AG
Hull. MUSE (for teachers): PO Box 43, 231/2 Friary Chambers, Whitefrairgate, Hull HU1 2HD
Tel: (0482) 20268
Keighly. Keighly Computer Club: Colin Price, 'Apple Garth', The Hob Hill, Steeton, Keighly, W Yorks
Tel: (0535) 54738
Newcastle. Newcastle & Washington BBC User Group (NEWBUG): Gary Bowmaker, c/o Washington Town Centre Library, The Galleries, Washington, Tyne & Wear
Tel: (0783) 813175 (eves)
Sheffield. Parsons Cross BBC User Group: Andrew Grant, 28 Rokeby Road, Sheffield S5 9FU
Tel: (0742) 461203
S Yorks. South Yorks Personal Computer Group: Bob Hindle, 139 Penrhyn Road, Sheffield S11 8UP
Wakefield. Wakefield BBC Micro User Group: PO Box 65, Wakefield, West Yorkshire WF2 6YZ

SCOTLAND

Econet. User Group (Scotland): c/o Michael Ryan, Balkeerie Cottage, Eassie, by Forfar, Angus
Central Scotland. BBC User Group: D Davidson, 1 Roxburgh Place, Larbett, Stirlingshire FK5 4UE
Tel: (0324) 558692
Inverclyde. Inverclyde BBC Micro Users Club: Robert Watt, 9 St John's Road, Gourock, Renfrewshire PA19 1PL
Tel: Gourock 39967

WALES

Cardiff. Cardiff BBC Computer Club: Geoffrey Barker, 2 Whitcliffe Drive, Penarth CF6 2RY
Tel: (0222) 701023

N. IRELAND

Belfast. Belfast Computer Club: Andrew White, 19 Greenpark Drive, Markethill, Co Armagh BT60 1PX

OVERSEAS

Australia. BBC Users Group of Canberra: PO Box E58, Queen Victoria Terrace, ACT 2600
Australia. Beebnet: M A Cowley, PO Box 262, Kingswood, South Australia 5062
Australia. Ozbeeb Sydney, meetings North Ryde. PO Box 1030, Parramatta 2150
Tel: day 635 4868, eve 868 4455
Australia: Dapto BBC User Group: PO Box 447, Dapto, NSW 2530
Canada. Atom Users Group of Canada: John Wood, 812 Cabot Trail, Milton, Ontario L9T 3M8
Canary Islands (Spain). BBC Micro Club Tenerife: PO Box 560, 3800 Santa Cruz de Tenerife
Eire. Irish Amateur Computer Club: Austin Vaughan, 35 Monastery Drive, Clondalkin, Dublin 22
Tel: 01-593112 (eves)
Eire: OIFIG (Official Irish Forth Interest Group): c/o Hugh Dobbs, Newton School, Waterford
Finland. Arjen Raateland, Hopeatie 10A21, 00440 Helsinki 44
France. Club Informatique Assevent: Claude Laurent, 1 rue du Marechal Leclerc, Assevent 59600
Tel: (27) 652294
Greece. Microclub: C Mantazavinatos, 17 Stournara Str. 106 82 Athens
Hong Kong. Acorn Computer Users Society of Hong Kong: PO Box 13330, Central PO, HK
Malaysia. Sabah Computer User Group: c/o Albert Vun, PO Box 69, Kota Vun, Sabah, Malaysia
Malta. BBC Micro Users Club (Malbeeb): Ray C Zammit, 20 Oleander Avenue, Santa Lucia
Netherlands. Big Ben Club: J W Vuurpijl, Hein Baderstraat 36, 2171 XP Sassenheim
New Zealand. BBC/Acorn Computer User Group of NZ: PO Box 9592, Wellington
New Zealand. Christchurch BBC & Electron Users Group: Mrs Rebe Nolan, 87 Palmers Road, Christchurch 9
Norway. BBC INFO: Horten Ingenlorhogskole, Skippergt. 6, 3190 Horten
Norway. Skandinavian BBC User Group: Frans-Otto Hendriks, Ludvig Karstensvei 14, 1064 Oslo 10
Pakistan. BBC Users Group: Capt. Z A Kidvai
Tel: Karachi 540986
South Africa: Acorn Atom Users Group: J G Dowling, 27 Oribi Avenue, Van Riebeeck Park, Kempton Park 1620
South Africa. Pretoria BBC Users Group: Stan Miller, PO Box 117, Montana 0151
South Africa. Tygerberg BBC User Group (Tygerbug): R P Donovan, 16 Bakker Street, Welgemoed, Bellville 7530
Sweden. BBC User Group: Anders Wichman, Folkungagatan 58, 116 22 Stockholm
Tasmania. BBC Users Group (Tasbeeb): Box 25 PO, North Hobart 7002

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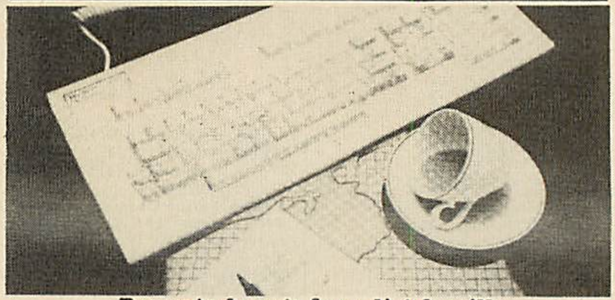
Accounts. BEEBACC: Brian Pain, 40a High Street, Stony Stratford, Milton Keynes
Tel: (0908) 564271
Adventure. International Adventure Club: Simon Martin Clarke, 10 Ennis Close, Harpenden, Herts AL5 1SS
Bulletin Boards. Forum 80: 421 Endike Lane, Hull HU6 8AG
CP/M. CP/M User Group: Diana Fordred, 72 Mill Road, Hawley, Dartford, Kent
Tel: (0322) 22669
Disc Users. Format 40/80 Club (BBC Disc User Group): Peter Hughes, 5 Marsh Street, Bristol BS1 4AA
Education. Micros and Primary Education (MAPE): c/o Mrs G Jones, 76 Sudbrooke Holme Drive, Sudbrooke, Lincs LN2 2SF
Electronics. Alton Computer & Electronics Society: Kevin Weatherhead, Sheen, Old Odiham Road, Alton, Hants GU34 4BW
Tel: Alton 87478
Heraldry Society. Colin Forrester, 5 Hook Road, Epsom, Surrey KT19 8TH
Logo. British Logo Users Group (BLUG): Richard Olney, c/o London Technology Network, 86-100 St Pancras Way, London WC1
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'Software Reviews',
A & B Computing, Dec. '85.

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'First Byte',
ACORN USER, May, '86.

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'ROM Roundup',
MICRO USER, July, '86.

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● BBC model B complete with Torch Z80 disc pack, dual 400k disc drives and ATPL ROM extender board, £450. Tel: (0264) 710715. JFG Wilson, Dale House, Anna Valley, Andover, Hants SP11 7NG.

● Watford Electronics video digitiser unit, ROM and manual, cost £125, accept £65. Ikegami B&W television camera plus Tamron lens, as new £75. Ideal for *AMX Pagemaker*. British Micro Graphpad, + software, hardly used, £35. Good quality lightpen and software, £9. RGB adaptor for using IBM colour monitor with BBC, £6. Tel: Preston (0772) 322377.

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Please include your cheque for £11.50 (inc. VAT) made payable to Redwood Publishing (please note: no POs; cheques only). This is the standard fee. Don't forget your name, address and phone number. Send cheque plus form to Acorn User Small Ads, 141-143 Drury Lane, London WC2B 5TF. Please print clearly.

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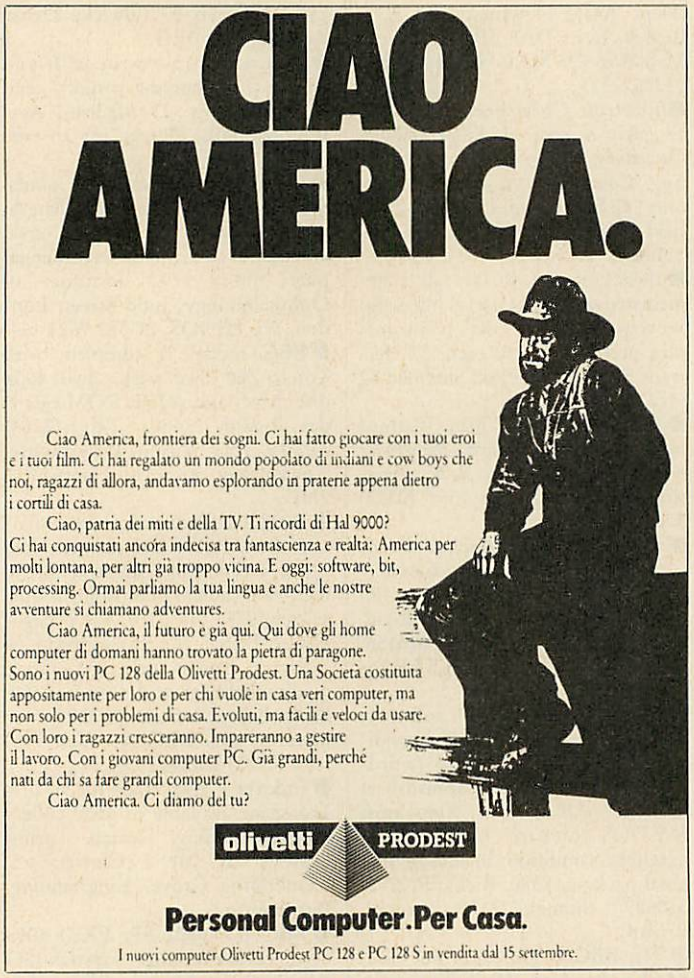
DIARY

Cowboy for Compact

Olivetti has done the business in Italy with the launch of the new Prodest 128S (a BBC Compact in disguise). It persuaded all the big guns in Commodore Italy to defect and then launched a Press campaign essentially saying that America had taught it what to do with computers and that the Prodest range was its proof that it could do it too. (Hal 9000, the rebellious computer from *2001 A Space Oddity*, gets a mention.)

We're sure that some readers over here reckon that the use of cowboys in computer advertising is asking for trouble however. And wasn't Hal the one who went around bumping everyone off on the Discovery?

(PS. For all you old timers or sci-fi buffs, what was the song that Hal sang as he was being unplugged?)



Is Olivetti tempting fate by associating its Prodest with cowboys?

In the net

Phone call of the week went to our software part-timer David Lawrence (who passed his driving test first time on September 22 after years of practice on *Revs*). It was a simple request from a reader who was a member of Prestel and Micronet and wanted to know if he could join Econet!

That brought back memories of a phone call four years ago from someone who wanted to know why their BBC micro wouldn't work. It kept on giving a 'no clock' message and turned out to be an Econet machine. He'd walked into a dealer and asked for a BBC with all the add-ons . . . and he got them (even if he would never use them).

What a hoot!

On the subject of Prestel and things, has anyone tried to dial into Owltel recently? The BBC's very own viewdata service went down because the Winchester drive which was running it all across an Econet went down one weekend.

Getting on for 17Mb of data down the drain – what a hoot!

Angry Aussies

Frank Dart, one of the authors of *Fleet Street Editor*, phoned us up to tell the tale of a recent visit to Australia. On divulging that he was the author, he was dragged off to a local school to give a talk on the package. They were very irate about the fact that he had left Tasmania – a big area for BBCs – off the map in the pack's library. That was nothing to what he and fellow author Jon Warmisham did to New Zealand. The whole country was moved thousands of miles closer to Aussie to fit on the map!

Soft option

We normally get fewer phone calls about software in the summer, but that wasn't the case this year. It appears that the staff of the other mags were on holiday and their readers were turning to us for the answers about the software they had published!

Baby talk

The mention of extra commands for the Master Compact, known as the Baby B before the launch, has sparked off one reader – who shall for obvious reasons remain nameless – to send in the following offering (with additions from our more juvenile editors):

*WIPE	for dribbles
*RENAME	for undecided parents
*INSERT	for dummies
*ACCESS	when *INSERT doesn't work
*HELP	when *ACCESS doesn't work
*TITLE	for posh babies
*BACKUP	for twins
*CHANGE	for nappies
*OPT 40	for more!

Good Evans

At last the end of the knock-kneed contest from the August issue of *AU*.

You probably won't remember, but the answer to our picture puzzle was Nick Evans and here's the poem from Phil Borman we couldn't fit in last month:

It looks to me like our old Nick,
Good Evans, is it really?
With that old beard that's just bum fluff,
It could be Amos Brearley!

I've put two and two together,
My spreadsheet says it's four,
So it must be adolescent Nick,
In the Acorn, that I saw.

I recognised his knees at once,
They're not a pretty sight.
Eddie Kayshun seems to know the lad,
I hope I've got it right.




Big Dipper formation


Crazy Funnel formation


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Compatible with the BBC B, B+, Master and Master Compact computers

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In the midst of the 25th century, the United Cosmological Federation declared war on the savage, belligerent aliens inhabiting the Magellanic galaxy. Only the most experienced of the U.C.F. pilots were chosen to embark upon the perilous mission of conquering and overthrowing the hordes of Magellan, the Galaforce.

Little is known of the inner zones of the galaxy, but on reaching the perimeter of Magellan all intruders are met with spectacular, non-hostile warning displays. However, venturing further will incite the aliens' wrath. Few and awestruck are the pilots who have returned from within — they have identified 10 types of fearsome alien: the most powerful being the scaly-skinned Calliston.

In common with the warmongering galaxies of yesteryear, the Magellanic aliens appreciate the maxims of "safety in numbers" and "strategy before action" — they always fly in selected preconceived formations. Surviving pilots have logged many such formations, and the pilots have given the formations laconic names: the Big Dipper, the U-Turn, the Staircase, Purple Rain, the Ski-Jump, the Corkscrew, Barbed Wire. Only one pilot has ventured beyond the 8th zone and survived — now retired from active service he relates stories of a perplexing formation which he named the Snaker.



The U.C.F. is now offering rewards to pilots for supreme acts of bravery within the Magellanic galaxy. Fast reflexes, trigger-happiness and a degree of calm cunning are required by all prospective pilots.

The game features include: 8-directional movement of the player's spaceship; fast and slow-speed bombs which home in when later zones are reached; keyboard and joystick control options; self-play demo mode; high-score tables; and superb atmospheric music.

PRICE: £9.95 (Cassette), £11.95 (BBC 5¼" disc), £14.95 (BBC Master Compact 3½" disc).



PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES

To encourage pilots to venture forth further into Magellan, a substantial reward has been offered for the first pilots to cross the outer 48 zones of the galaxy. The successful competitors will be entered for a prize draw, the winner receiving a radio-controlled aeroplane worth £300. Two runners-up will each receive a £10 consolation prize and a trophy. Closing date: 31st March, 1987.

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An action close-up


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A camouflaged Battle fortress (Enhanced BBC Master version)

STRYKER'S RUN for the BBC Micro B, B+, Master and Master Compact.

Compatible with the BBC B, B+, Master and Master Compact computers.

Stryker's Run features probably the best graphics ever seen on the BBC Micro; the action is intense and the animation is superlative.

The battlefield graphics include cities, edifices, wrecked buildings, trees gravestones, bridges, despatch-posts, military bases, helicopters and jet ships, with hills and mountains in the background. The Master-enhanced version also includes statues, watch-towers, a neglected cafe, a deserted cinema, aircraft hangars, aeroplanes, trucks and tanks.

For many years, a war has ensued between the Allied Nations and the Volgans. The battle was reaching a stalemate position, but recently the Allies through good intelligence work and some luck have managed to obtain the plans of the Volgan's next offensive. If the Allied Forces can capitalise on these plans they can end the impasse and the war. You play the role of Commander John Stryker commissioned to take this top-secret information to the Allies' HQ.

Your character in the game can jump, run, duck, fire his laser pistol and throw grenades. He can also board aircraft and fly them, making use of their more powerful weaponry.

Your opponents, the Volgans, have a variety of weapons at their disposal comprising rifles, pistols, grenades, machine-guns, mortars, mines, helicopter gunships, rocket launchers and SAM missiles.

Game Author: Chris Roberts.



PRICE: £9.95 (cassette), £11.95 (BBC Micro 5¼" disc), £14.95 (Master Compact 3½" disc).

PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES PRIZES



If you complete the game, you can enter our competition. The prizes include a radio controlled 4-wheel-drive off-road racer (worth £200) complete with control system, trophies and £20 in consolation prizes.

Closing date: 31st March, 1987.

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